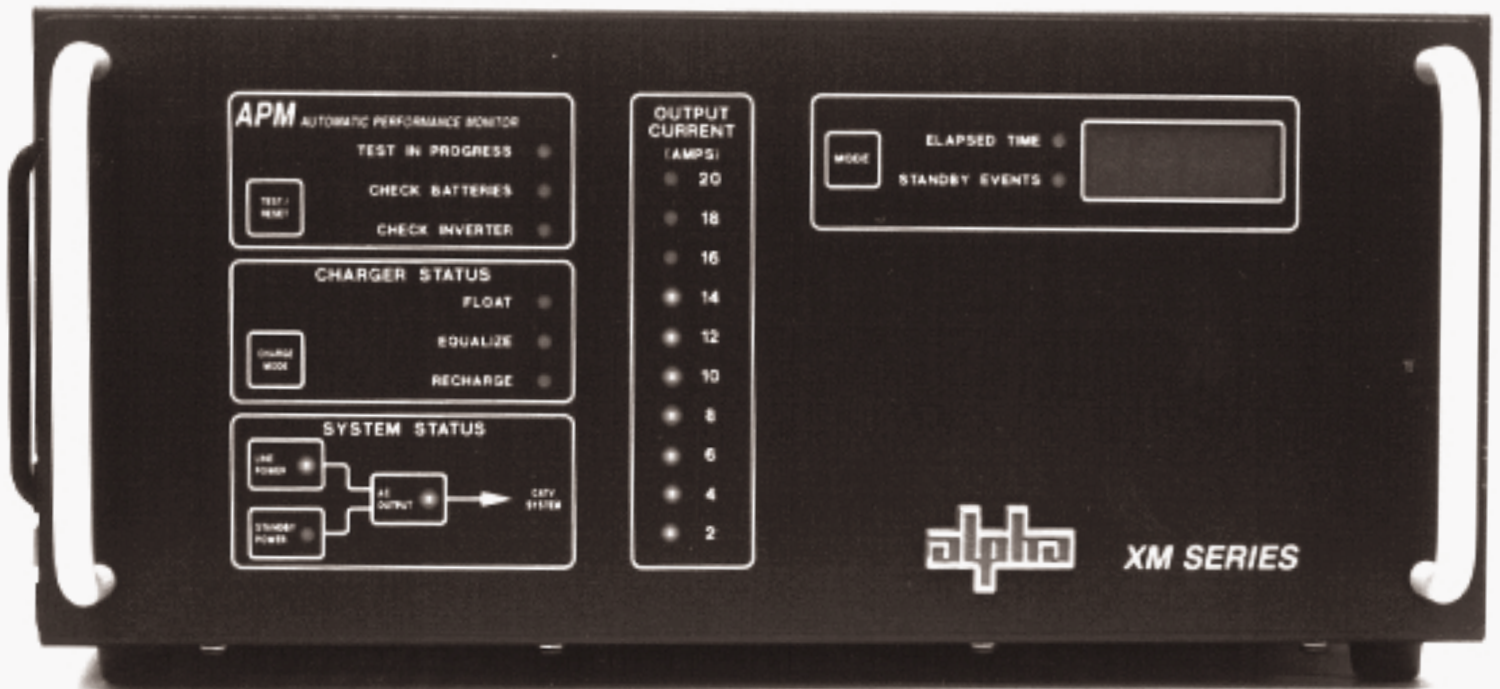


***XM / XP* SERIES**

Uninterruptible Power Supplies



XM 6005 Series

XM 6007 Series

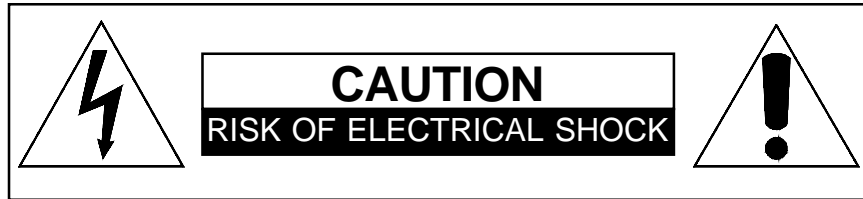
XM 6010 Series

XM 6012 Series

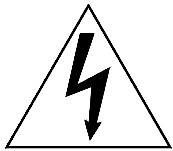
XM 6015 Series

Technical Manual

IMPORTANT SAFETY INSTRUCTIONS CONTAINED IN THIS MANUAL

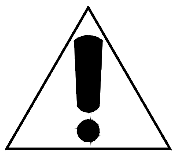


CAUTION: TO REDUCE THE RISK OF ELECTRICAL SHOCK, AND ENSURE THE SAFE OPERATION OF THIS UNIT, THE FOLLOWING SYMBOLS HAVE BEEN PLACED THROUGHOUT THE MANUAL. WHERE THESE SYMBOLS APPEAR, SERVICING SHOULD BE PERFORMED ONLY BY QUALIFIED PERSONNEL.



DANGEROUS VOLTAGE

A DANGEROUS VOLTAGE EXISTS IN THIS AREA OF THE POWER SUPPLY. USE EXTREME CAUTION.



ATTENTION

IMPORTANT OPERATING INSTRUCTIONS. THIS PROCEDURE SHOULD BE PERFORMED ONLY BY QUALIFIED SERVICE PERSONNEL.

SAVE THESE INSTRUCTIONS

IMPORTANT TECHNICAL NOTE



CAUTION:

When operating the XP Series Uninterruptible Power Supply, a minimum load of at least 1.0 Amperes (approximately 10% of the output rating of the power supply) must be connected to the output. Failure to do so could damage the load or the unit's ferroresonant power transformer.

Damage caused by this condition will not be covered under warranty.

For further information, contact Alpha Technologies or your nearest Alpha representative.

IMPORTANT SAFETY PRECAUTIONS



THE POWER SUPPLY SHOULD BE SERVICED ONLY BY QUALIFIED PERSONNEL.



THE POWER SUPPLY CONTAINS MORE THAN ONE LIVE CIRCUIT. EVEN THOUGH AC IS NOT PRESENT AT THE INPUT, IT MAY BE PRESENT AT THE OUTPUT.

WHEN USING AN EXTERNAL SERVICE DISCONNECT, VERIFY THAT IT IS EQUIPPED WITH A HIGH MAGNETIC CIRCUIT BREAKER PROPERLY RATED (AMPERAGE) FOR USE WITH THE POWER SUPPLY.

WHEN IN STORAGE, BATTERIES SHOULD BE CHARGED AT LEAST ONCE EVERY THREE MONTHS TO ENSURE OPTIMUM PERFORMANCE AND BATTERY LIFE.

WEAR EYE PROTECTION, SUCH AS SAFETY GLASSES OR A FACE SHIELD, WHENEVER WORKING WITH BATTERIES.

USE GLOVES WHEN HANDLING BATTERIES. BATTERY ELECTROLYTE IS ACIDIC AND MAY CAUSE BURNS.

NEVER SMOKE NEAR BATTERIES. SPARKS, FLAMES OR OTHER SOURCES OF IGNITION MAY CAUSE A BATTERY EXPLOSION.

ALWAYS CARRY A SUPPLY OF WATER, SUCH AS A WATER JUG, TO WASH THE EYES OR SKIN IN THE EVENT OF EXPOSURE TO BATTERY ELECTROLYTE.

USE PROPER LIFTING TECHNIQUES WHENEVER HANDLING THE ENCLOSURE, POWER MODULE OR BATTERIES. GROUP 31 SIZE BATTERIES, USED IN THE MAJORITY OF CABLE TELEVISION APPLICATIONS, CAN WEIGH AS MUCH AS 70 LBS.

USE A BUCKET TRUCK, OR SUITABLE SAFETY EQUIPMENT SUCH AS A SAFETY HARNESS AND CLIMBING SPIKES, WHEN SERVICING POLE INSTALLATIONS.

ALWAYS SWITCH THE POWER SUPPLY'S BATTERY CIRCUIT BREAKER TO OFF BEFORE DISCONNECTING BATTERY CABLES. THIS GREATLY REDUCES THE CHANCE OF SPARK AND POSSIBLE BATTERY EXPLOSION.

DO NOT ALLOW LIVE BATTERY WIRES TO CONTACT THE ENCLOSURE OR POWER SUPPLY CHASSIS. POSSIBLE EXPLOSION OR FIRE CAN OCCUR.

BEFORE PLACING A CURRENT LOAD ON THE BATTERIES, (SUCH AS WHEN SWITCHING THE POWER SUPPLY TO STANDBY), USE THE ENCLOSURE DOOR AS A SHIELD IN THE EVENT OF A BATTERY EXPLOSION.

INSPECT BATTERIES FOR SIGNS OF CRACKS, LEAKING OR SWELLING.

WHEN REPLACING BATTERIES, ALWAYS USE THOSE OF AN IDENTICAL TYPE. NEVER INSTALL OLD OR UNTESTED BATTERIES.

CHECK THE BATTERY'S DATE CODE. BATTERIES OLDER THAN SEVERAL YEARS SHOULD NOT BE USED.

AVOID THE USE OF UNINSULATED TOOLS OR OTHER CONDUCTIVE MATERIALS WHEN HANDLING BATTERIES OR WORKING INSIDE THE ENCLOSURE.

SPENT OR DAMAGED BATTERIES ARE CONSIDERED ENVIRONMENTALLY UNSAFE. ALWAYS RECYCLE USED BATTERIES.

BATTERY CHARGING



ALWAYS REFER TO THE BATTERY MANUFACTURER'S RECOMMENDATION FOR SELECTING CORRECT FLOAT AND EQUALIZE CHARGE VOLTAGES. FAILURE TO DO SO COULD DAMAGE THE BATTERIES.



VERIFY THE POWER SUPPLY'S BATTERY CHARGER FLOAT AND EQUALIZE CHARGE VOLTAGES. REFER TO THE POWER SUPPLY'S OPERATION MANUAL.

BATTERIES ARE TEMPERATURE SENSITIVE. DURING EXTREMELY COLD CONDITIONS, A BATTERY'S CHARGE ACCEPTANCE IS REDUCED AND REQUIRES A HIGHER CHARGE VOLTAGE; DURING EXTREMELY HOT CONDITIONS, A BATTERY'S CHARGE ACCEPTANCE IS INCREASED AND REQUIRES A LOWER CHARGE VOLTAGE.

TO COMPENSATE FOR CHANGES IN TEMPERATURE, THE BATTERY CHARGER USED IN THE POWER SUPPLY IS TEMPERATURE COMPENSATING. FLOAT AND EQUALIZE CHARGE VOLTAGES WILL VARY DEPENDING UPON BATTERY TEMPERATURE.

IF BATTERIES APPEAR TO BE OVER OR UNDER-CHARGED, FIRST CHECK FOR DEFECTIVE BATTERIES AND THEN VERIFY CORRECT CHARGER VOLTAGE SETTINGS.

BATTERY PREVENTIVE MAINTENANCE



BATTERIES SHOULD BE INSPECTED EVERY THREE TO SIX MONTHS TO ENSURE OPTIMUM PERFORMANCE.

VISUALLY INSPECT BATTERIES FOR SIGNS OF CRACKS, LEAKS OR SWELLING.



CHECK BATTERY TERMINALS AND CONNECTING WIRES. BATTERY TERMINAL CONNECTORS SHOULD BE CLEANED PERIODICALLY AND RETIGHTENED TO APPROXIMATELY 60 INCH/LBS. SPRAY THE TERMINALS WITH AN APPROVED BATTERY TERMINAL COATING SUCH AS NCP-2.

CHECK BATTERY VOLTAGES UNDER LOAD. USE A LOAD TESTER IF AVAILABLE. DIFFERENCES BETWEEN ANY BATTERY IN THE SET SHOULD NOT BE GREATER THAN 0.3 VDC.

CHECK THE POWER SUPPLY'S BATTERY CHARGER VOLTAGES. REFER TO THE BATTERY MANUFACTURER'S RECOMMENDATION FOR CORRECT CHARGE VOLTAGES AND THE POWER SUPPLY'S OPERATION MANUAL FOR CORRESPONDING CHARGER SETTINGS.

NUMBER THE BATTERIES (1, 2, 3) INSIDE OF THE ENCLOSURE FOR EASY IDENTIFICATION.

ESTABLISH AND MAINTAIN A BATTERY MAINTENANCE LOG.

XP Series Uninterruptible Power Supplies

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INTRODUCTION

1.1 THE XP SERIES UNINTERRUPTIBLE POWER SUPPLY

Alpha XP Series Uninterruptible Power Supplies (UPS) are designed for powering signal processing equipment in Cable Television and Broadband LAN distribution systems. The power supply, which consists of an XM Series Power Module and a pole or ground-mount enclosure, provides the critical load with current-limited, regulated AC power that is free from disturbances such as spikes, surges, brownouts or blackouts. Backup power is achieved by a set of rechargeable, gelled electrolyte (no maintenance) batteries.

During LINE operation, AC power enters the module where it is converted to a "quasi" square wave and regulated (at the required output voltage). It is then passed onto the load via the SPI (Service Power Inserter) located inside the power supply enclosure. At the same time, power is directed to the battery charger to maintain a float charge to the batteries.

When the incoming AC line voltage drops significantly, or a utility power outage occurs, the XM Series power module automatically transfers to inverter (STANDBY) operation in order to maintain power to the load. During the transfer, energy contained in the module's ferroresonant transformer continues to supply power to the output. Depending upon the type of batteries used, and the loading on the power supply, backup power can continue for several hours. When utility line power returns, the XM Series power module waits momentarily for the utility voltage and frequency to stabilize and then initiates a smooth, in-phase transfer back to AC line power. Once the transfer is complete, the battery charger quickly recharges the batteries in preparation for the next utility power outage.

The XP Series Uninterruptible Power Supply contains an impressive list of features including an "OUTPUT CURRENT" display to indicate output current to the load; a "CHARGER STATUS" block to display the various battery charging modes; a "SYSTEM STATUS" block to display LINE and STANDBY operation, plus indicate acceptable AC output power; an output fuse to protect against excessive short circuit currents; and a battery circuit breaker to protect the DC circuit. Optional features can include a "STANDBY DATA" display to indicate "total outage time" and "number of standby events;" an APM (Automatic Performance Monitor) to self-test the inverter and batteries at regular intervals; and a USM (Universal Status Monitor) plug-in logic upgrade to facilitate status monitoring.

UL Recognized and CSA Approved, the XP Series Uninterruptible Power Supply is designed to be one of the most rugged, reliable, and versatile power supplies available. Alpha Technologies, recognized as an international market leader in the field of backup power, offers complete technical support and prompt, reliable service to ensure that your power supply continues to provide years of trouble-free operation.

1. INTRODUCTION

1.2 Theory of Operation

The XP Series Uninterruptible Power Supply consists of an XM Series power module, a pole or ground-mount enclosure, and a set of gelled electrolyte, no maintenance batteries. The power module contains a ferroresonant transformer, resonant capacitor, dual-mode temperature-compensated battery charger, DC to AC converter (inverter), transfer / isolation relay, and a main circuit module assembly containing the logic circuit.



The XP Series Uninterruptible Power Supply

1.2.1 AC (LINE) Operation

During AC LINE operation, utility power is routed into the primary winding of ferroresonant transformer T1 and through the contacts of the transfer / isolation relay K101. At the same time, power is directed to the auxiliary transformer T101 which provides power for the control circuitry. A charger / inverter winding on transformer T1 supplies the battery charger circuit. AC capacitor C1 forms the resonant circuit of ferroresonant transformer T1 which provides excellent noise and spike attenuation, short circuit current limiting, and output voltage regulation. The ferroresonant transformer produces a "quasi" square wave output which resembles a rounded square wave.



NOTE: WHEN MEASURING THE OUTPUT VOLTAGE OF FERRORESONANT TRANSFORMERS, USE ONLY A TRUE RMS AC VOLTMETER. NON-RMS READING METERS ARE CALIBRATED TO RESPOND TO PURE SINE WAVES AND WILL NOT PROVIDE AN ACCURATE READING WHEN MEASURING A "QUASI" SQUARE WAVE OUTPUT.

1.2 Theory of Operation, *continued*

1.2.2 Inverter (STANDBY) Operation

When the incoming AC line voltage drops significantly, or a complete power outage occurs, the control logic's line monitor activates STANDBY operation. The battery powered inverter comes on-line (in-phase with the failing AC line) as the transfer / isolation relay switches to prevent AC power from back-feeding to the utility. During the brief transfer from LINE to STANDBY operation, the energy contained in the ferro-resonant transformer continues to supply power to the load. The following changes occur: The transfer / isolation relay K101 opens to disconnect the AC line from the primary winding of ferroresonant transformer T1. The control logic drives the inverter transistors on and off at line frequency. This switching action converts the DC battery current into AC in the inverter winding of the ferroresonant transformer which provides regulated power to the load. The control logic, which includes a circuit to protect the inverter transistors from over-current damage, monitors the condition of the batteries during inverter operation. Since a prolonged AC line outage would severely discharge the batteries, resulting in permanent damage, the control logic disables the inverter when the batteries drop to approximately 10.5 VDC / battery (31.5 VDC / set).

When AC line voltage returns, the power module transfers back to LINE operation within 10 to 50 seconds. This delay allows the AC line voltage and frequency to stabilize before the control logic phase-locks the inverter's output to the utility input. It then de-energizes the transfer / isolation relay, re-connects the AC line to the primary of the ferroresonant transformer and disconnects the batteries from the inverter. This results in a smooth, in-phase transfer back to utility power without interruption of service to the load. The battery charging circuit is then activated to recharge the batteries in preparation for the next power outage.

1.2.3 Charger Operation

The XP Series Uninterruptible Power Supply uses a dual-mode, temperature-compensated battery charger. During AC line operation, a charger / inverter winding on ferroresonant transformer T1 feeds the charger circuit which provides "float" and "equalize" charge voltages to the batteries. The circuit consists of a switching regulator, inductor L1 and other associated components. The charger (inverter) winding of transformer T1 produces an AC voltage that is regulated by SCRs Q301, Q302 and filtered by inductor L1. This produces a regulated DC battery charging voltage. The charge current passes through R104 to provide current-limit sensing for the charging circuit. Fuse F301, located on the removable, Main Circuit Module assembly, protects the circuit in the event of charger malfunction or reversal of the battery leads (Refer to the component layout drawing at the back of the manual).

The standard control logic provides a constant (programmable) float charge to the batteries. A switch (CHARGE MODE) SW201 located on the front panel of the power module allows a technician to manually activate the charger's equalize mode which has a 1.2 hour duration. With the optional APM or USM logic upgrade installed, the equalize charging mode becomes an automatic user-programmable function.

When the XM Series module resumes LINE operation, the charger quickly recharges the batteries. The charge current is determined by the acceptance level of the batteries, but limited to 10 Amps maximum. As the batteries approach full charge, the charger's current tapers off to normal float levels.

The three color-coded LEDs on the XP front panel "CHARGER STATUS" block display charging modes. When lighted, the LEDs indicate FLOAT (green), EQUALIZE (yellow) and RECHARGE (red). Recharge represents a charge rate greater than 5 Amps.

1. INTRODUCTION

1.3 SPECIFICATIONS

MODEL CONFIGURATION	XM6005 -24 J5	XM6005 -24 J6	XM6007 -	XM6007 E	XM6007 P	XM6010 -	XM6010 E	XM6010 P
INPUT								
Voltage (VAC)	100	100	120	230	220	120	230	220
Frequency (Hz)	50	60	60	50	60	60	50	60
Current Max. (A) ¹	6.7	6.7	7.2	4	4.2	9	4.7	5
Low AC Ref. (VAC)	80	80	95	182	174	95	182	174
OUTPUT								
Voltage (VAC)	60	60	60	60	60	60	60	60
Current Max. (A)	5.3	5.3	7	7	7	10	10	10
Power (VA)	320	320	420	420	420	600	600	600
BATTERIES								
Number	2	2	3	3	3	3	3	3
Voltage (VDC)	24	24	36	36	36	36	36	36
Backup Time (Hrs)*	6	6	7	7	7	4.5	4.5	4.5
WEIGHTS								
(lbs)	35	35	44	42	44	44	42	44
(kg)	16	16	19.9	19	19.9	19.9	19	19.9

MODEL CONFIGURATION	XM6010 -24	XM6012 -	XM6012 E	XM6015 -	XM6015 E	XM6015 -J5	XM6015 -J6	XM6015 MX	XM6015 P
INPUT									
Voltage (VAC)	120	120	230	120	230	100	100	127	220
Frequency (Hz)	60	60	50	60	50	50	60	60	60
Current Max. (A) ¹	9	10	5.5	12	6.7	14	14	12	6.7
Low AC Ref. (VAC)	95	95	182	95	182	80	80	100	174
OUTPUT									
Voltage (VAC)	60	60	60	60	60	60	60	60	60
Current Max. (A)	10	12	12	15	15	15	15	15	15
Power (VA)	600	720	720	900	900	900	900	900	900
BATTERIES									
Number	2	3	3	3	3	3	3	3	3
Voltage (VDC)	24	36	36	36	36	36	36	36	36
Backup Time (Hrs)*	3	5	5	3.1	3.1	3.1	3.1	3.1	3.1
WEIGHTS									
(lbs)	44	34	40	55	63	63	55	55	55
(kg)	19.9	15.4	18.1	24.9	28.4	28.4	24.9	24.9	24.9

¹ At nominal line voltage.

*Note: Battery run times are subject to temperature, age and overall condition of batteries.

1.3 SPECIFICATIONS, *continued***Regulation**

Input Voltage (VAC) +/- 15%

Input Frequency (Hz) +/- 3%

Output Voltage (VAC) +/- 5%

Output Frequency (Hz) +/- 1%

Inverter Frequency Stability +/-0.05%**Output Current Limit** 150% of maximum output rating**Transfer Time** Uninterrupted Output**Efficiency** 90% or better (LINE)

80% typical (STANDBY)

Battery Type Gelled electrolyte (or equiv) 12 VDC batteries**Battery Low Voltage Cutout** 1.75 Volts per cell

24 VDC Systems 21.0 VDC

36 VDC Systems 31.5 VDC

48 VDC Systems 42.0 VDC

Battery Recharge Acceptance

24 VDC Systems 25.5 VDC (typical)

36 VDC Systems 37.5 VDC (typical)

48 VDC Systems 50.0 VDC (typical)

Battery Float Charge Voltage 2.16 VDC to 2.30 VDC per cell

24 VDC Systems 25.9 VDC to 27.6 VDC (selectable)*

36 VDC Systems 39.0 VDC to 41.4 VDC (selectable)*

48 VDC Systems 52.0 VDC to 55.2 VDC (selectable)*

Battery Equalize Charge Voltage 2.16 VDC to 2.45 VDC per cell

24 VDC Systems 25.9 VDC to 29.4 VDC (selectable)*

36 VDC Systems 39.0 VDC to 44.1 VDC (selectable)*

48 VDC Systems 52.0 VDC to 58.8 VDC (selectable)*

Temperature Compensation24 VDC Systems -0.03 Volts/⁰F (-0.06 Volts/⁰C)36 VDC Systems -0.05 Volts/⁰F (-0.09 Volts/⁰C)48 VDC Systems -0.07 Volts/⁰F (-0.12 Volts/⁰C)**Battery Charging Current**

10 Amps maximum

Battery Recharge Time 12 hours typical (from low cutout) with 75 Ah batteries**Operating Temperature Range** -40⁰ to +131⁰ F (-40⁰ to +55⁰ C)**Finish** Black, Epoxy Powder Paint**Dimensions****Enclosures:**

PME 22" W x 24" H x 14" D (559mm x 610mm x 356mm)

PWE 24" W x 24" H x 14" D (610mm x 610mm x 356mm)

UPE 28" W x 35.3" H x 17" D (711mm x 889mm x 432mm)

UPE/M 28" W x 45" H x 21.3" D (711mm x 1143mm x 540mm)

Modules:

All XM Series 15.0" W x 7.2" H x 12.3" D (381mm x 183mm x 312mm)

Weights**Enclosures:**

PME 34 lbs. (15.4 kg)

PWE 47 lbs. (21.4 kg)

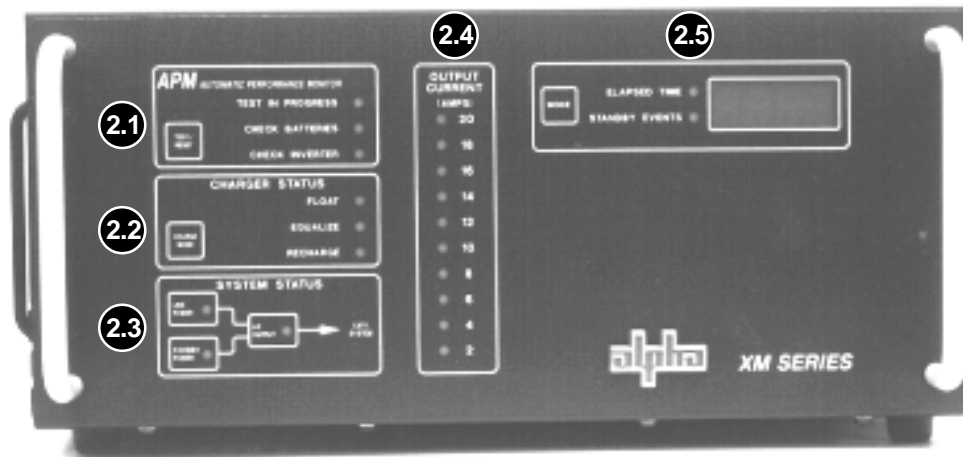
UPE 66 lbs. (30.0 kg)

UPE/M 124 lbs. (56.4 kg)

Specifications @ 77⁰ F (25⁰ C)

* When using APM, charge voltages should be user selected according to specific battery manufacturer's recommendations.

THE XM SERIES FRONT PANEL



2.1 - APM Automatic Performance Monitor (optional)

- "Test/Reset" Switch
- "Not Installed" LED
- "Test in Progress" LED
- "Check Batteries" LED
- "Check Inverter" LED

2.2 - Charger Status Block

- "Charge Mode" Switch
- "Float" LED
- "Equalize" LED
- "Recharge" LED

2.3 - System Status Block

- "Line Power" LED
- "Standby Power" LED
- "AC Output" LED

2.4 - Output Current Display

- LED Display

2.5 - Standby Data Display (optional)

- "Mode" Switch
- "Elapsed Time" LED
- "Standby Events" LED
- Time/Events Window

FRONT PANEL

2.1 APM (Automatic Performance Monitor) Status Block

On units equipped with an optional APM logic upgrade, the XM Series power module automatically self-tests the batteries and inverter. The duration and intervals are user programmable (see section 6.10). If a failure is detected during self-test, either the red "CHECK BATTERIES" or red "CHECK INVERTER" LEDs in the APM status block will flash to indicate the circuit that has failed. At the same time, the external LRI option on the enclosure will flash to signal that maintenance is required. The APM self-test feature is a great aid when trouble-shooting the power supply and can be manually activated by pressing the "TEST/RESET" switch. The yellow "TEST IN PROGRESS" LED will light as the power supply transfers into self-test mode. The red "STANDBY POWER" LED in the SYSTEM STATUS block will come ON to indicate that the power supply is in inverter operation. Since self-test only simulates an outage, the green "LINE POWER" LED will remain ON, indicating that utility power is still available. If a fault is detected, the power supply will transfer back to line power without interruption to the output.

2.1.1 "TEST/RESET" Switch

The "TEST/RESET" switch is standard on all XM Series power modules, but functional only on units equipped with APM or USM logic upgrades. It is used to manually cycle the power supply in and out of self-test mode, and to reset alarms. If a fault is detected during the APM self-test mode, the "TEST/RESET" switch resets the enclosure's flashing LRI (Local and Remote Indicator) and the SSR (Standby Status Relay) alarms; however, the red "CHECK BATTERIES" and "CHECK INVERTER" LEDs cannot be reset until the fault is corrected.

2.1.2 "NOT INSTALLED" (green) LED

On units not equipped with an APM logic upgrade, the green "NOT INSTALLED" LED will light whenever the "TEST/RESET" switch is pressed.

2.1.3 "TEST IN PROGRESS" (yellow) LED

The yellow "TEST IN PROGRESS" LED indicates that the power supply is in self-test mode.

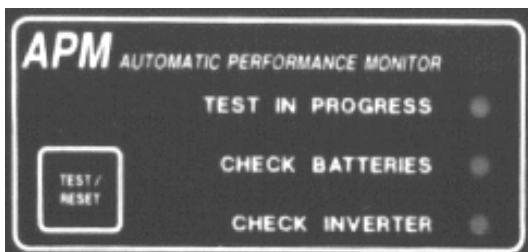
2.1.4 "CHECK BATTERIES" (red) LED

If the red "CHECK BATTERIES" LED is flashing, it indicates that one or more of the batteries are unable to carry the load and that maintenance is required. The flashing LED cannot be reset until the fault is corrected. NOTE: Under this condition, the power supply will not be able to support inverter operation.

2.1.5 "CHECK INVERTER" (red) LED

If the red "CHECK INVERTER" LED is flashing, it indicates that the inverter has failed to produce AC and that maintenance is required. The flashing LED cannot be reset until the fault is corrected. NOTE: Under this condition, the power supply will not be able to support inverter operation.

APM (Automatic Performance Monitor) Status Block



(OPTIONAL FEATURE)

"TEST/RESET" Switch

(Manually initiates self-test; resets alarm)

"NOT INSTALLED" (green) LED

(Illuminates if TEST/RESET switch is pressed with APM option not installed)

"TEST IN PROGRESS" (yellow) LED

(Indicates self-test mode)

"CHECK BATTERIES" (red) LED

(Indicates battery failure)

"CHECK INVERTER" (red) LED

(Indicates inverter failure)

2. FRONT PANEL

2.2 Charger Status Block

The XM Series power module is equipped with a dual mode, temperature-compensated battery charger. The "CHARGER STATUS" block is broken into categories to reflect the different charging modes:

2.2.1 "CHARGE MODE" Switch

The "CHARGE MODE" switch is used to manually sequence the battery charger through float and equalize modes. On non-APM units, equalize can only be initiated by pressing the "CHARGE MODE" switch. Equalize is an automatic feature on units equipped with APM and USM logic upgrades.

2.2.2 "FLOAT" (green) LED

The green "FLOAT" LED indicates that the battery charger is delivering a float charge to the batteries.

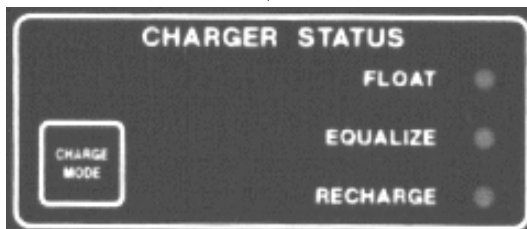
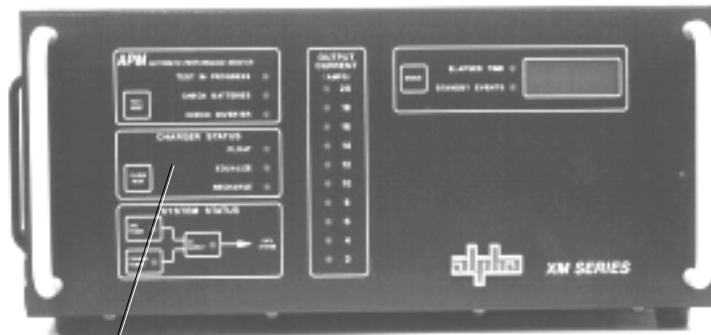
2.2.3 "EQUALIZE" (yellow) LED

The yellow "EQUALIZE" LED indicates that the battery charger is delivering an equalize charge to the batteries. On units equipped with standard logic, equalize can only be activated manually and lasts for approximately 1.2 hours. On units equipped with APM or USM logic upgrades, equalize can be activated either automatically (pre-selected duration and interval) or manually.

2.2.4 "RECHARGE" (red) LED

The red "RECHARGE" LED indicates that the batteries are drawing more than 5 Amps of current from the charger. The charge current is determined by the acceptance level of the batteries, but limited to 10 Amps maximum. As the batteries approach full charge, the charger's current tapers off to normal float. The red LED is ON only when the charge current exceeds 5 Amps in either float or equalize modes.

CHARGER STATUS Block



"CHARGE MODE" Switch

(Manually sequences charger)

"FLOAT" (green) LED

(Indicates float charge to the batteries)

"EQUALIZE" (yellow) LED

(Indicates equalize charge to the batteries)

"RECHARGE" (red) LED

(Indicates a charge current > 5 Amps)

(STANDARD FEATURE)

2.3 System Status Block

The "SYSTEM STATUS" block is broken into three categories to quickly identify the power supply's operational status: running on AC line power; running on batteries; and nominal output power to the load.

2.3.1 "LINE POWER" (green) LED

The green "LINE POWER" LED indicates that power from the utility is present and that the power supply is operating in AC LINE mode.

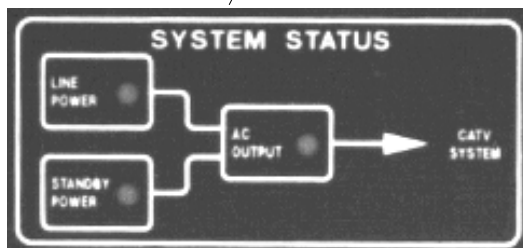
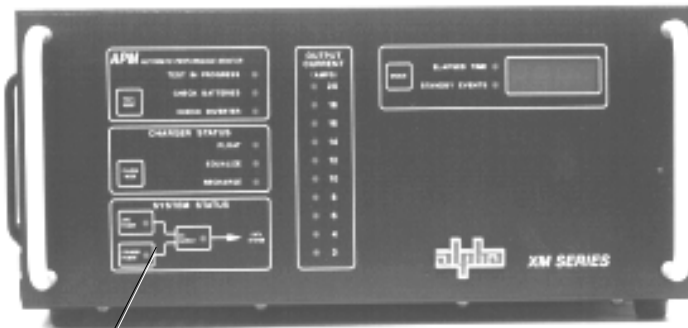
2.3.2 "STANDBY POWER" (red) LED

The red "STANDBY POWER" LED indicates that the power supply is operating from its battery backup. When AC from the utility is lost, the green "LINE POWER" LED goes OFF and the red "STANDBY POWER" LED comes ON as the unit transfers to inverter operation. Whenever the red LED is ON, the unit is running on backup power.

2.3.3 "AC OUTPUT" (green) LED

The green "AC OUTPUT" LED indicates that acceptable voltage is available at the power module's output. Regardless of the input mode, "LINE POWER" or "STANDBY POWER," the "AC OUTPUT" LED should remain ON at all times.

SYSTEM STATUS Block



"LINE POWER" (green) LED
(Indicates the presence of utility AC)
"STANDBY POWER" (red) LED
(Indicates inverter operation)
"AC OUTPUT" (green) LED
(Indicates acceptable output voltage)

(STANDARD FEATURE)

2. FRONT PANEL

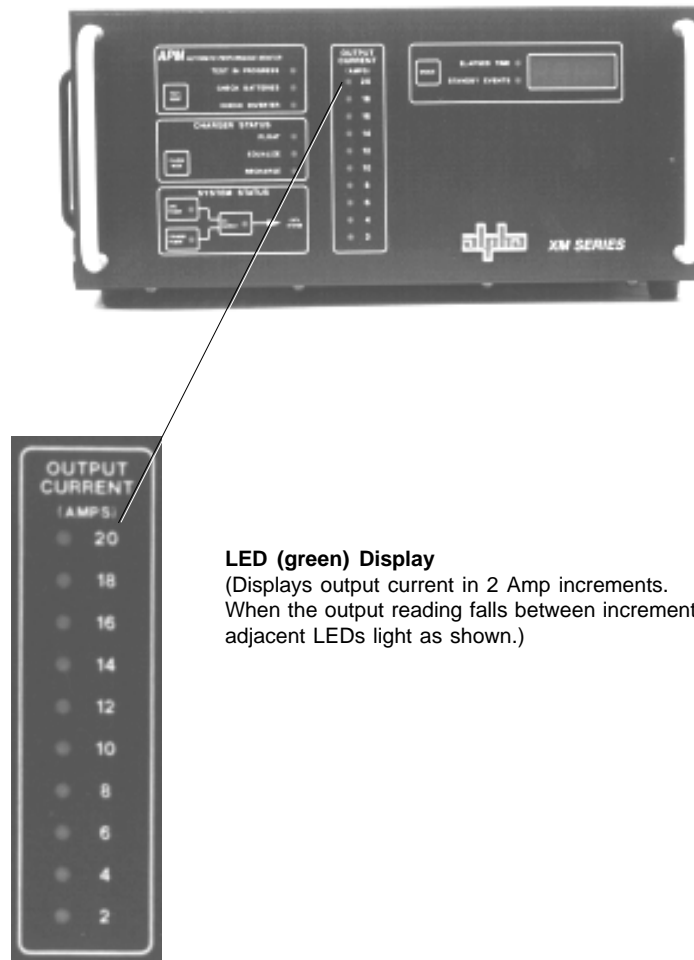
2.4 Output Current Display

The amount of current from the power supply to the load is indicated by the "OUTPUT CURRENT" display. The LED display is useful for determining the overall status of the load. When there is no load connected, the LEDs on the display will be OFF. In situations where LEDs light above the rated output of the power supply, such as 18 or 20 Amps, an overload or short circuit condition exists in the load.

2.4.1 LED Display

The LEDs are set in 2 Amp increments from 2 to 20 Amps; however, the display is accurate to 1 Amp. When the output current falls between increments, both adjacent LEDs light.

OUTPUT CURRENT Display



LED (green) Display

(Displays output current in 2 Amp increments. When the output reading falls between increments, adjacent LEDs light as shown.)

(STANDARD FEATURE)

2.5 Standby Data Display (SDD)

The optional, dual-function LED "STANDBY DATA" display is used to keep track of accumulated inverter run time, and to record the number of standby events that have occurred. The "ELAPSED TIME" clock is activated only when the power supply is in inverter mode. Elapsed time will continue to accumulate until the clock is reset. The "STANDBY EVENTS" counter displays the number of standby events that have lasted longer than 60 seconds duration. Standby events will continue to accumulate until the counter is reset. The SDD is equipped with an on-board battery to maintain data even when the main circuit module is completely removed or a complete power outage (including low battery shutdown) occurs.

2.5.1 "MODE" Switch

The "MODE" switch activates the display and verifies the mode of operation. When the switch is pressed, the "ELAPSED TIME" LED will light (or "STANDBY EVENTS" LED depending upon the mode). At the same time, the corresponding information will appear in the "TIME/EVENTS" window for approximately 10 seconds. The next mode is activated by pressing the switch again. "ELAPSED TIME" and "STANDBY EVENT" information can be toggled by briefly pressing the "MODE" switch.

NOTE: To clear either the "ELAPSED TIME" or "STANDBY EVENT" memory, select the desired mode. Press and hold the "MODE" switch until the LED flashes. Then, press the MODE switch twice (in rapid succession). A single decimal point will appear in the display when the memory has been cleared.

2.5.2 "ELAPSED TIME" LED

The "ELAPSED TIME" LED indicates the mode as the "TIME/EVENTS" window displays the time accumulated during inverter operation. The clock, which displays time to the nearest 0.1 hours, will continue to accumulate time until the memory is manually cleared.

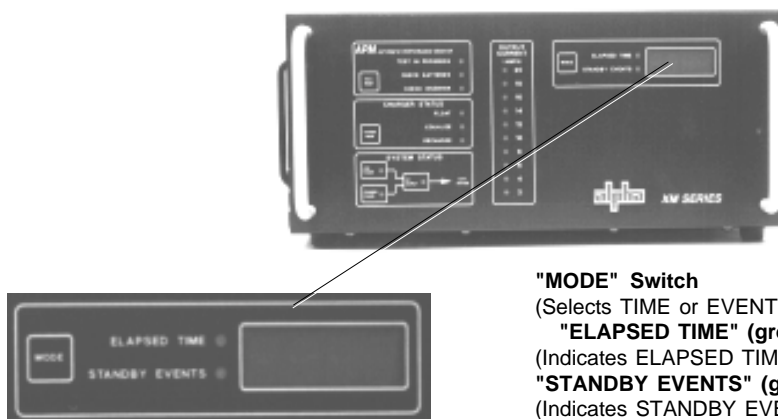
2.5.3 "STANDBY EVENTS" LED

The "STANDBY EVENTS" LED indicates the mode as the "TIME/EVENTS" window displays standby events that have lasted more than 60 seconds in duration. The counter will continue to register standby events until the memory is manually cleared.

2.5.4 "TIME/EVENTS" Window

The "TIME/EVENTS" window displays "ELAPSED TIME" in 0.1 hr increments, up to 999.9. "STANDBY EVENTS" are displayed in increments of 1, up to 9999.

STANDBY DATA Display



(OPTIONAL FEATURE)

"MODE" Switch

(Selects TIME or EVENTS mode; clears memory)

"ELAPSED TIME" (green) LED

(Indicates ELAPSED TIME mode)

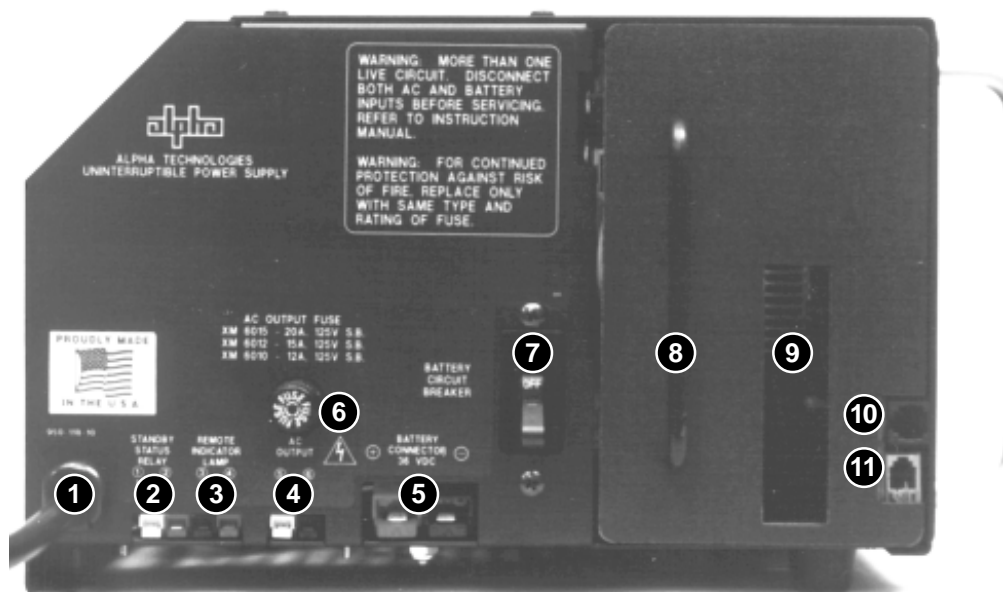
"STANDBY EVENTS" (green) LED

(Indicates STANDBY EVENTS mode)

"TIME/EVENTS" Window

(Displays TIME and EVENTS information)

THE XM SERIES SIDE PANEL



1. - AC Power Cord

(Connects to the enclosure's convenience outlet.)

2. - Standby Status Relay (SSR)

White (1) = Common; Red (2) = N.O. / N.C.

(Select contact normally open / closed with wire on back plane board.)

3. - Remote Indicator Lamp (LRI)

Black (3) = Negative; Red (4) = Positive

(Connects to pole-mount enclosure's optional external lamp)

4. - AC Output

White (5) = Neutral; Black (6) = Hot

(Connects to SPI Service Power Inserter; or ACI Lamp option / SPI)

5. - Battery Connector

Red = Positive; Black = Negative

(Connects to batteries)

6. - AC Output Fuse

(XM 6015 = 20A; XM 6012 = 15A; XM 6010 = 12A)

7. - Battery Circuit Breaker

(60 Amp magnetic)

8. - Main Circuit Module Assembly Access Handle

(Access to 10A Battery Charger fuse; APM and USM logic upgrades)

9. - USM Connector Access

(Used for status monitoring interface connections)

10. - Remote Temperature Sensor Connector (RTS)

(Connects to charger for exact battery temperature measurements)

11. - Data Port

(Used for data retrieval and diagnostic testing with optional DataLogger)

SIDE PANEL

3.1 AC Power Cord

The AC power cord plugs directly into the enclosure's convenience outlet. Since the power module does not have an ON/OFF switch, the utility circuit breaker should be used as the main switch. In situations where the power supply is to be completely powered down, first switch the battery breaker OFF. This will prevent the unit from going into inverter operation when utility AC is removed.

3.2 Standby Status Relay (optional)

On APM and USM units equipped with the SSR (Standby Status Relay), a dry "Form C" contact accommodates systems requiring remote alarms. The left connector (1) white is configured as common. The right connector (2) red is configured "normally open" (contacts close when alarm is present). For special applications, contact 2 can be configured "normally closed" (contacts open when alarm is present) by repositioning the wire located on the module's back plane board from position P104 to P105.

3.3 Remote Indicator Lamp (optional)

The LRI lamp, used in conjunction with the APM (Automatic Performance Monitor), plugs directly into the REMOTE INDICATOR LAMP connector. The connector fits in one direction only with the wiring configuration clearly marked for easy identification. The (negative) wire is connected to the left side of the connector (3) black. The (positive) is connected to the right (4) red. The LRI circuit is rated at 24 VDC, 250mA. Use only Alpha P/N 740-139-20 (24 Volt LRI Lamp and Socket).



3.4 AC Output

The SPI (Service Power Inserter), which couples output power to the load, plugs directly into the AC OUTPUT connector. The connector is color-coded and fits in one direction only with the wiring configuration clearly marked for easy identification. The (neutral) wire is located on the left side of the connector (5) white; the (hot) on the right (6) black.

NOTE: ACI OPTION

The ACI option is an external indicator of the XM power module's AC output status (see page 16). If the ACI is included in the installation, the lamp's connector plugs directly into the power module's output (5 & 6). The SPI then plugs into the second connector located on the ACI lamp assembly.



3.5 Battery Connector

The batteries plug directly into the power module's battery connector. The connector is color-coded and fits in one direction only. Note: Always verify proper polarity of cables before connecting the batteries to the power module. Polarity is clearly marked for easy identification. The red cable (+) is located on the left side of the connector; the black cable (-) on the right. If, for some reason, the cables become interchanged at the batteries, the battery circuit breaker will trip.

3.6 AC Output Fuse

The AC output fuse prevents short circuit current from entering the load. Fuses are rated according to the particular model: **(XM6015 = 20 A 250V; XM6012 / XM6012 E = 15 A 250V; XM6010 / XM6010 E = 12 A 250V)**. NOTE: If the green "AC OUTPUT" LED located in the front panel SYSTEM STATUS block is OFF, indicating no AC output, check this fuse.

3.7 Battery Circuit Breaker

The 60 Amp battery circuit breaker is used to disconnect the batteries from the module's DC circuit. With the breaker turned off, the power supply will not transfer to standby mode. The inverter is disabled and the battery charger is unable to charge the batteries. If a short circuit occurs in the DC circuitry, or battery polarity is accidentally reversed, the breaker will trip.



3.8 Main Circuit Module Assembly Access Handle

The main circuit module can be removed by firmly pulling the handle located on the side of the unit. This facilitates easy access for logic upgrades, selection of float and equalize charges and internal fuse replacements. The assembly can be removed during LINE operation without interruption to the output. NOTE: See cautionary statements in Section 6.8.

3.9 USM Connector Access

A cutout is provided in the Main Circuit Module Assembly to allow access to the board connectors located on the USM logic upgrade. Status Monitoring communications and tamper switch cables plug directly into the board's keyed connectors.

3.10 Remote Temperature Sensor Connector (RTS)

The Remote Temperature Sensor plugs directly into the "RJ-11C" type connector located on the side panel. The sensor end of the RTS is routed into the battery compartment and taped directly to the side of the center battery. This provides precise battery temperature measurements in order to accurately adjust the battery charge voltage with changes in battery temperature. If the remote temperature sensor is not connected, a temperature sensor in the main circuit module adjusts the battery charge voltage with changes in ambient temperature within the power supply.

3.11 Data Port

The Data Port is used in conjunction with optional hand-held DataLogger to retrieve and store data directly from the power module during routine preventive maintenance. Caution: No other devices should be plugged into the data port.

STANDARD FEATURES

XP Series Uninterruptible Power Supplies are available in the following packages:

XM Series Power Module with standard control logic; Pole-mount enclosure (PME) complete with galvanized mounting brackets, Service Power Inserter (SPI), "High Magnetic" circuit breaker and duplex receptacle. Optional pole (PWE) and ground-mount (UPE and UPE/M) enclosures are available. Batteries are separate.

4.1 XP6005 Series Uninterruptible Power Supplies

*XM6005-24 J5 Module - (100 VAC, 50 Hz Input) / (60 VAC, 5.3 Amp, 320 VA Output)

*XM6005-24 J6 Module - (100 VAC, 60 Hz Input) / (60 VAC, 5.3 Amp, 320 VA Output)

4.2 XP6007 Series Uninterruptible Power Supplies

XM6007 Module (120 VAC, 60 Hz Input) / (60 VAC, 7 Amp, 420 VA Output)

XM6007 E Module (230 VAC, 50 Hz Input) / (60 VAC, 7 Amp, 420 VA Output)

XM6007 P Module (220 VAC, 60 Hz Input) / (60 VAC, 7 Amp, 420 VA Output)

4.3 XP6010 Series Uninterruptible Power Supplies

XM6010 Module (120 VAC, 60 Hz Input) / (60 VAC, 10 Amp, 600 VA Output)

XM6010 E Module (230 VAC, 50 Hz Input) / (60 VAC, 10 Amp, 600 VA Output)

XM6010 P Module (220 VAC, 60 Hz Input) / (60 VAC, 10 Amp, 600 VA Output)

*XM6010-24 Module (120 VAC, 60 Hz Input) / (60 VAC, 10 Amp, 600 VA Output)

4.4 XP6012 Series Uninterruptible Power Supplies

XM6012 Module (120 VAC, 60 Hz Input) / (60 VAC, 12 Amp, 720 VA Output)

XM6012 E Module (230 VAC, 50 Hz Input) / (60 VAC, 12 Amp, 720 VA Output)

4.5 XP6015 Series Uninterruptible Power Supplies

XM6015 Module (120 VAC, 60 Hz Input) / (60 VAC, 15 Amp, 900 VA Output)

XM6015 E Module (230 VAC, 50 Hz Input) / (60 VAC, 15 Amp, 900 VA Output)

XM6015 J5 Module (100 VAC, 50 Hz Input) / (60 VAC, 15 Amp, 900 VA Output)

XM6015 J6 Module (100 VAC, 60 Hz Input) / (60 VAC, 15 Amp, 900 VA Output)

XM6015 P Module (220 VAC, 60 Hz Input) / (60 VAC, 15 Amp, 900 VA Output)

*XM6015-48 SE Module (230 VAC, 50 Hz Input) / (60 VAC, 15 Amp, 900 VA Output)

Alpha Technologies also manufactures:

XM4808 E (230 VAC, 50 Hz Input) / (48 VAC, 8 Amp, 384 VA Output)

*XM4808-24 E (230 VAC, 50 Hz Input) / (48 VAC, 8 Amp, 384 VA Output)

* Note: "-24" models utilize a 24 VDC battery system; "-48" models utilize a 48 VDC battery system. All other models listed utilize a 36 VDC battery system.

OPTIONAL FEATURES

The following options can be ordered factory installed or, in most instances, can be field retrofitted by qualified service personnel.

5.1 APM-XP (Automatic Performance Monitor)

The APM-XP is a field replaceable, plug-in logic card that plugs directly into the edge connector located on the back of the main circuit module. It upgrades the power supply's standard logic functions to include a self-test feature that automatically tests the batteries and inverter at pre-selected intervals. If a problem is detected during the self-test mode, the APM activates an alarm circuit and flashes the red "CHECK BATTERIES" or "CHECK INVERTER" LEDs, located on the front panel, to indicate the circuit that has failed the test.

5.2 USM (Universal Status Monitor)

The USM is a field replaceable, plug-in logic card that allows the XP Series power supply to be configured for pre-existing status monitoring systems. It can be configured for parallel or serial applications. The USM facilitates use with common amplifier monitoring systems such as Scientific Atlanta "6585" (SA), Magnavox "6DSS" (M), Jerrold "RSM" (J), AM Communications "TMC-8061" (AM), Texscan "Vital Signs" (T) and C-COR "Quick Alert" (C). For systems utilizing AlphaSoft status monitoring software, the USM-(A) can be manipulated, manually or automatically, to provide information such as battery condition, inverter operation, and alarm status.

5.3 LRI (Local and Remote Indicator)

Used in conjunction with APM and USM logic upgrades, the LRI lamp (red) is located on the outside of pole-mount enclosures and duplicates the function of the module's "STANDBY POWER" LED in the System Status block. The lamp comes ON only when the power supply is running on backup power (STANDBY). During normal AC line operation, the lamp remains OFF. Whenever a fault is detected during the APM self-test, the lamp flashes to indicate that service is required. The LRI can be used as a simple form of status monitoring by allowing cable technicians to check the operational status of the power supply without having to climb the pole and open the enclosure.

5.4 ACI (AC Indicator)

The AC Indicator (green) is located next to the LRI lamp on the outside of pole-mount enclosures. The ACI is similar in function to the module's (green) "AC OUTPUT" LED in the System Status block. As long as there is voltage present at the output, the ACI lamp remains ON. As with the LRI, this acts as a simple form of status monitoring by allowing cable technicians to check the output status of the power supply without having to climb the pole and open the enclosure.

5.5 SDD (Standby Data Display)

The dual-function, "STANDBY DATA" display is used to keep track of accumulated inverter run time, and to record the number of standby events. The "ELAPSED TIME" clock is activated only during inverter operation. The "STANDBY EVENTS" counter displays the number of standby events lasting longer than 60 seconds in duration.

5.6 SSR (Standby Status Relay)

On APM and USM units equipped with the "STANDBY STATUS RELAY," dry "Form C" contacts are provided to accommodate systems requiring remote alarms. If, during the APM self-test function, a fault is detected, the alarm circuit will activate. The contacts are configured "common" and "normally open" (contacts close when alarm is present). The contacts can be reconfigured "normally closed" (contacts open when alarm is present) by moving a wire located on the module's back plane board.

5.7 LA-P (Lightning Arrestor)

The LA-P consists of a 350 Joule, Metal Oxide Varistor (MOV). It plugs directly into the enclosure's convenience outlet, eliminating the need for hard-wired MOVs. Enclosed in a plastic housing, the LA-P is used to provide additional protection from voltage spikes caused by lightning and other power disturbances. No wiring is necessary.

5.8 BCK-X (Battery Cable Kit)

Battery Cable Kits are heavy-duty wiring assemblies used to connect (3) gelled electrolyte, or equivalent batteries to the power module. All kits come with mounting hardware and a quick connect.

5.9 BCK-FX (Fused Battery Cable Kit)

Fused Battery Cable Kits are available for applications requiring additional battery circuit protection. Cables come with a 40A in-line fuse.

5.10 BMO (Battery Mat Option)

Used for a variety of applications, the rubber battery mat provides additional thermal isolation and battery shelf protection in PME enclosures.

5.11 BTO (Battery Tray Option)

Used mainly with less common wet cell applications, the BTO is designed to contain and prevent electrolyte from leaking onto the enclosure's shelf. It can also be used to provide additional thermal isolation from the power module. Battery trays are constructed of PVC and accommodate individual battery sizes up to Group 31. PME enclosures only.

5.12 MST (Module Slide Tray)

The MST is designed for use on PME and PWE pole-mount enclosures only and is compatible with all XM Series power modules. The MST's movable platform rides on a set of heavy-duty ball bearing slides to promote access to the power module during servicing. It is available factory installed or as a field retrofit kit.

5.13 DSE (Delete Service Entrance)

For installations requiring an externally-mounted service disconnect, the enclosure's internal service entrance, if equipped, can be removed. The DSE option, which must be specified at the time of order, eliminates the internal service entrance assembly. A Square D 15 Amp "HM" high magnetic circuit breaker (for use with the external service disconnect) and duplex outlet are included with this option.

5.14 ISE (Internal Service Entrance)

For applications requiring an internal service disconnect to be located inside the enclosure, the ISE option features a Square D 15 Amp "HM" high magnetic circuit breaker, an agency approved service disconnect box and duplex outlet.

5.15 STH (Storm Hoods)

Storm hoods are used on PME and PWE pole-mount enclosures to prevent snow from entering the enclosure during blizzard conditions. Specify the type of enclosure when ordering.

5.16 XPA (XP Adaptor)

The XPA contains a set of quick connects used to adapt existing Alpha enclosures, previously wired for AM Series power products, for use with XM Series power modules.

5. OPTIONAL FEATURES

5.17 APP60S (Service Power Supply)

The APP60S is a portable, non-standby power supply used to provide conditioned AC power to the load when the main power module is out of service. A front panel switch allows the APP60S to be set for 30 VAC or 60 VAC applications. Used in conjunction with the "Jones" connector and "ALT/ON" switch located on the enclosure's SPI (Service Power Inserter), power can be transferred from the main module to the APP60S without interrupting the load.

5.18 Batteries

Sealed, gelled electrolyte (no maintenance) batteries are recommended for use with XP Series uninterruptible power supplies. The majority of Cable Television and Broadband LAN operators prefer this type of battery due to its exceptional performance, safety record and service life. Batteries are available in ratings of 75Ah and 100Ah.

5.19 ABC-12 (Battery Charger)

The ABC-12 is designed for use with 12 volt specialty batteries such as gelled electrolyte products used in communications, UPS and standby applications. Selectable float or equalize charge modes optimize battery recharging. The charger is ideal for recharging batteries that have been in lengthy storage, plus batteries can be re-balanced using a parallel charge before use in series applications.

5.20 Enclosures

The XM Series power module can be used in either pole or ground-mount installations. Pole-mount enclosures, PME (for cold climates) and PWE (for warm climates), are constructed of heavy-duty aluminum and come with two, galvanized steel mounting brackets. UPE and UPE/M ground-mount enclosures are constructed of heavy-duty aluminum and come with Galvanized (UPE/M only) steel doors. Alpha enclosures are vented to promote natural convection cooling and prolong battery life.

Alpha enclosures contain separate compartments for the batteries and power module. The battery compartment accommodates (3) Group 31 gelled-electrolyte, no-maintenance batteries and is equipped with a battery slide tray (except PME) for easy access. The module compartment accommodates the power module, a 15 Amp "HM" circuit breaker assembly, duplex receptacle and SPI (Service Power Inserter). The AC power connection to the breaker assembly is made through a conduit knockout on the rear of the PWE enclosure or through the base of the PME, UPE and UPE/M. The cable connection is made directly to the SPI's "VSF" coaxial fitting located on the rear of the PWE, or at the base of the PME, UPE and UPE/M. There is adequate space in the module compartment to accommodate a variety of power modules, indicator lamps, and components used for status monitoring.

5.21 PS Series (Pedestal Supports)

Alpha pedestal supports provide a quick, one-step solution for ground-mount enclosure installations. Constructed of pre-formed, high density polyethylene (HDPE), the pedestal support eliminates the need for costly concrete work. The large body design provides excellent "hand hole" working space, allowing room for cable bends, wire loops and grounding connections. Pedestal supports are available for use with Alpha UPE, UPE/M, PWV/PED, PED/M and PMD/PED ground-mount enclosures.

5.22 DataLogger

The hand held DataLogger is used to run diagnostics, manipulate the APM (Automatic Performance Monitor), and to test individual battery voltages. Maintenance data, such as Input Line Voltage, Output Current, Battery Voltage, Battery Charge Voltage (float and equalize), Battery Charge Current, Inverter Events, Accumulated Inverter Run Time, Technician ID Number, Power Supply Address, Test Date and Time, can be retrieved and stored in the DataLogger. Data from as many as 32 power supplies can be downloaded to a DOS compatible computer at the headend to create a maintenance history file, thus automating data retrieval, log entry and consistent data formatting.

5.23 AC Series (Amp Clamp)

Alpha Technologies' Amp Clamps are designed to protect active and passive equipment (such as amplifiers and power inserters) from voltage surges and transients. Amp Clamps can be ordered as retrofit kits, or factory installed in the desired host hardware. A Product/Serial Number label is included with each kit so that retrofitted equipment can be easily identified. The Amp Clamp circuit consists of two, rugged SCRs (silicon controlled rectifiers) connected in an inverse parallel configuration with a steady state current rating of 35 Amps and a one cycle (8 ms) pulse rating of 500 Amps. The SCRs are triggered into conduction whenever the Amp Clamp's bi-directional trigger diode senses the presence of voltage transients exceeding its 104 - 115 Volt peak threshold. The fast response trigger diode gates the appropriate SCR ON (in nanoseconds) to shunt the surge current to ground, effectively protecting sensitive equipment from transient overvoltage conditions. The Amp Clamp is compatible with the following host hardware: **C-COR** PS-550-C power inserter, PS-900-C power inserter and T500 amplifiers (6 & 8 port); **G.I./Jerrold** SSP-PI power inserter, SSP-3 two-way splitter and SSP-(7, 9, 12, or 16) directional couplers; **Lindsay** LPI-100 and 1GHz LPI-100 power inserters; **Magnavox** 4-LPI, 5-LPI, 8-LPI, 49-LPI and 59-LPI power inserters; **RCA** PI-1 power inserter; **RMS** CA-5400 and UP-6400 power inserters, and CA-5402/RFI two-way splitter; **Scientific Atlanta** SAIF-RFI power inserter; **Regal** RPI-60 (blue) power inserter; and **Antronix** RPI-60 (green) power inserter. If your equipment is not listed, contact Alpha Technologies for availability.

5.24 CAT-PAK (Computer Aided Training)

Computer Aided Training for power supply maintenance is available for either MAC® or IBM® (and compatible) formats. Technicians can learn and develop maintenance skills at their own pace before leaving the office, thus reducing overall maintenance time and standardizing maintenance practices. Even though the CAT-PAK training program was developed for use with AP Series power products, the overall information can be applied to XP installations. The program can be manipulated entirely by the user without the need for assistance. Complete system packages, including hardware and software, are available from Alpha Technologies. Please specify format and disk requirements (3 1/2" or 5 1/4") when ordering.

5.25 Instructional Videotapes

Instructional videotapes are available for Alpha power products including Product Overview, Theory of Operation, Installation, and Maintenance. Developed primarily for use with AP Series power products, the tapes contain useful information that can be applied to XP installations. Each tape is available in either NTSC (VHS) or PAL formats and covers all aspects of the Alpha Standby Power Supply. Transcripts of each tape are available upon request.

"Alpha Technologies: Market Leader in Standby Power" (P/N 048-082-00) is a 20 minute presentation which highlights standby power products and emphasizes reliability, ease of operation and customer service.

"The Alpha Standby Power Supply" (P/N 048-070-00) is a 10 minute conceptual overview of the Alpha standby power supply. The tape covers the advantages and disadvantages of forward and reverse transfer systems and compares them to Alpha's approach to standby power.

"Installing the Alpha CATV Standby Power Supply" (P/N 026-006-B4) is a 20 minute, step-by-step, description of the installation process. The tape includes ground and pole-mount applications, start-up procedures and testing the unit.

"Power Supply Maintenance for AP and AM Series Power Products" (P/N 026-006-B2 [108-3]) is a 30 minute presentation that covers all aspects of AP Series standby power supply operation and recommended maintenance procedures.

INSTALLATION



To ensure operator safety:

1. Power supplies should be installed only by qualified personnel and in accordance with applicable electrical codes.
2. Use eye protection whenever working with batteries.
3. Use only sealed, lead-acid type batteries (gelled-electrolyte or equiv., 55 Ah min.)
4. Use a bucket truck, or suitable climbing equipment such as a safety harness and climbing spikes, whenever installing or servicing pole-mount installations.



6.1 Unpacking and Inspection

Carefully remove the power module and enclosure from their shipping containers. Make sure that the following items have been included:

1. XM Series Power Module (including BCK-X battery cable kit).
2. PME Pole-mount enclosure (with two, galvanized mounting brackets, SPI service power inserter, 15 Amp "HM" circuit breaker assembly with duplex receptacle). PWE, UPE and UPE/M are optional enclosures. Note: Batteries are shipped separately.
3. Operator's Manual.
4. Any other ordered options.

Inspect the contents. If items are damaged or missing, contact Alpha Technologies and the shipping company immediately. Most shipping companies have only a short claim period.

SAVE THE ORIGINAL SHIPPING CONTAINER.

In the event a unit needs to be returned for service, it should be packaged in its original shipping container. If the original container is not available, make sure the unit is packed with at least three inches of shock-absorbing material to prevent shipping damage. Note: Do not use popcorn-type material. Alpha Technologies is not responsible for damage caused by improper packaging on returned units.

READ THE OPERATOR'S MANUAL.

Become familiar with the power supply's front and side panel. Review the drawings and illustrations contained in the manual before proceeding. If you have questions regarding the safe installation or operation of this unit, contact Alpha Technologies or your nearest Alpha representative.

6.2 Pole-mount Enclosure Installation (PME and PWE)

PME and PWE enclosures are designed to be mounted on wooden poles; however, special brackets are available for concrete pole applications. Mounting bolts should go completely through the wooden pole and be secured from the back with a large washer and nut. The two galvanized mounting brackets mount between the enclosure and pole. Most codes require the base of the enclosure to be located a minimum height from the ground. Always verify height restrictions before proceeding. (Refer to the pole-mount drawings located at the back of the manual.)

NOTE: THE MAJORITY OF POLES ARE THE PROPERTY OF THE LOCAL UTILITY. BEFORE INSTALLING AN ENCLOSURE, THE LOCATION AND THE METHOD OF MOUNTING MUST BE APPROVED BY THE UTILITY.

Materials required:

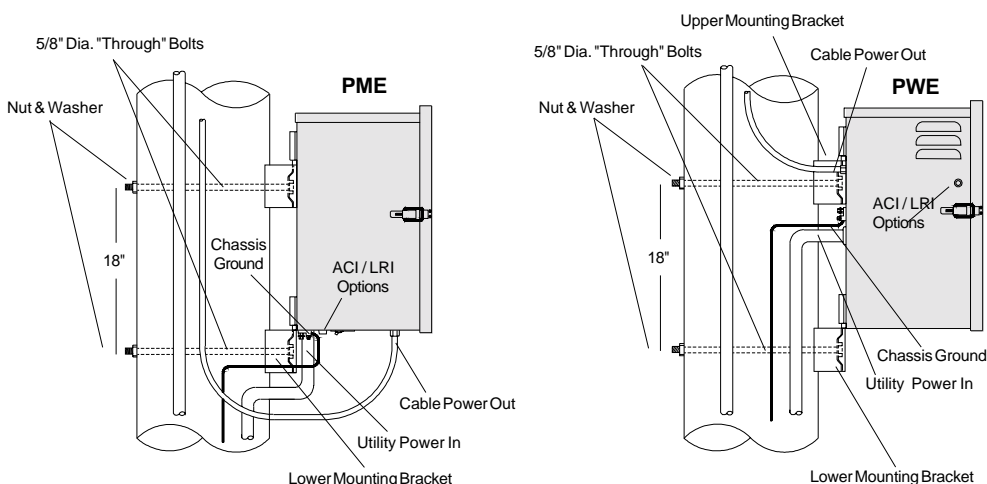
Two (2) 5/8" dia. machine bolts (UNC thread) SAE Grade 5 or better, length to suit pole;
Two (2) 5/8" dia. zinc-plated flat washers;
Two (2) 5/8" dia. hex nuts (UNC thread).

Tools required:

Auger or drill for boring 3/4" dia. holes in the wooden pole;
Mallet or hammer;
Assorted sockets or wrenches.

Procedure:

1. Unpack the galvanized brackets and turn the enclosure face-down on a soft surface.
2. Slide one bracket up through the lower mounting strap on the rear of the enclosure. The bracket's flanges face away from the enclosure. Secure the lower mounting bracket using the 3/8" x 3/4" hex bolt included with the enclosure.
3. Mark the position for the upper mounting bracket on the utility pole. Drill a 3/4" hole completely through the pole. Secure the bracket with a 5/8" machine bolt, washer and nut. Do not fully tighten the bolt at this time.
4. Position the enclosure on the upper mounting bracket. It may be necessary to slightly rock the enclosure and pull downward to properly seat it on the bracket. Center the enclosure on the pole.
5. Mark the hole for the lower mounting bracket. Lift the enclosure off of the top bracket and drill the lower hole. Spacing between the holes should be 18.0" on center.
6. Slide the enclosure back into place over the top mounting bracket. Align the lower bracket with the hole and secure it with a 5/8" machine bolt, washer and nut. Tighten both brackets until the flanges dig into the wood approximately 1/4".
7. The enclosure is now ready for the utility connection, power module and batteries.



PME and PWE Pole-mount Enclosures

6. INSTALLATION

6.3 Ground-mount Enclosure Installation (UPE and UPE/M)

UPE and UPE/M enclosures are designed to bolt directly to a Pedestal Support or concrete pad. Four 1/2" holes are provided in the base of the enclosure to accommodate 3/8" Anchor or J-bolts. Secure the enclosure using a flat washer, lock washer and 3/8" nut at each mounting bolt. Note: Enclosures must be mounted flush with a smooth surface and not over-torqued to prevent damage. (Refer to the ground-mount drawings located at the back of the manual).

6.3.1 Pedestal Support Preparation

(Refer to the pedestal support drawings located at the back of the manual).

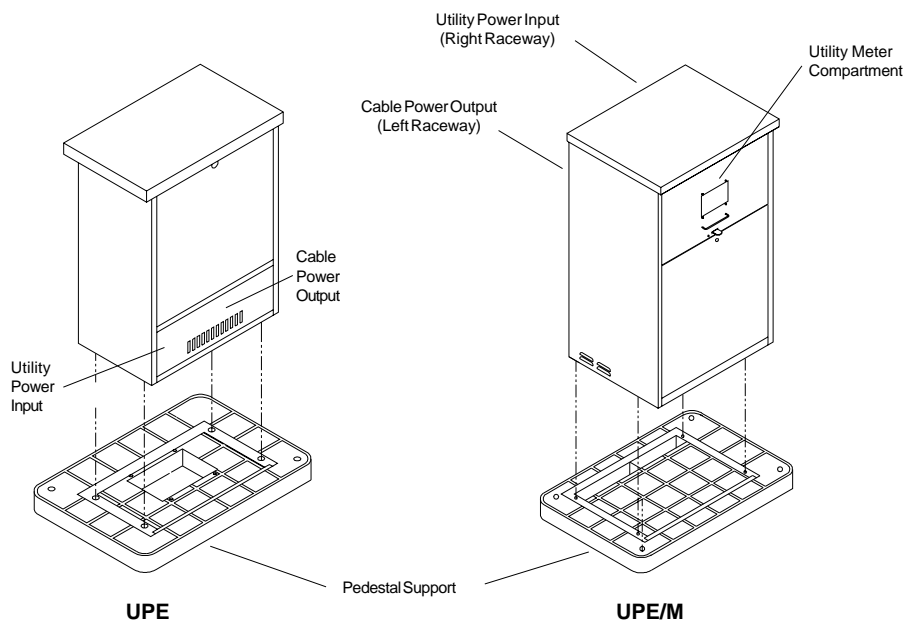
Pedestal supports, available from Alpha, provide a quick, one-step solution for ground-mount enclosure installations. Constructed of pre-formed, high density polyethylene, the pedestal support eliminates the need for costly concrete work. The large body design provides excellent "hand hole" working space, allowing room for cable bends, wire loops and grounding connections. Pedestal supports are available for use with Alpha UPE and UPE/M ground-mount enclosures. Installation is as easy as digging a hole to the appropriate depth to accommodate the base of the pedestal support and backfilling using a suitable material. See 1.3.2 below for recommended utility and Cable TV conduit placements.

6.3.2 Concrete Pad Preparation

(Refer to the ground-mount drawings located at the back of the manual).

UPE - Four 3/8" J-bolts should be centered with the pad 24" (side to side) and 10" (front to back). From the front of the pad, service conduits should be placed with the utility entrance left of the center line; Cable TV to the right. If required, an 8' dedicated ground rod should be placed near the utility conduit.

UPE/M - Four 3/8" J-bolts should be centered with the pad 24" (side to side) and 14" (front to back). Service conduits should enter the pad between the rear mounting studs and 6" to either side of the pad's center line. From the front of the pad, Cable TV conduit should be placed on the left; utility on the right. If required, an 8' dedicated ground rod should be placed near the utility conduit.



UPE and UPE/M Ground-mount Enclosures



6.4 Connecting Utility Power



CAUTION: THE FOLLOWING SHOULD BE PERFORMED ONLY BY QUALIFIED SERVICE PERSONNEL AND IN COMPLIANCE WITH LOCAL ELECTRICAL CODES. CONNECTION TO UTILITY POWER MUST BE APPROVED BY THE LOCAL UTILITY BEFORE INSTALLING THE POWER SUPPLY.

NOTE: UL AND NEC REQUIRE THAT A SERVICE DISCONNECT SWITCH (UL LISTED) BE PROVIDED BY THE INSTALLER AND BE CONNECTED BETWEEN THE POWER SOURCE AND THE ALPHA POWER SUPPLY. CONNECTION TO THE POWER SUPPLY MUST INCLUDE AN APPROPRIATE SERVICE ENTRANCE WEATHER HEAD.

WIRING THE ENCLOSURE'S UTILITY SERVICE

Utility power enters the enclosure through a 1 1/8" opening at the bottom of PME, UPE and UPE/M, and the rear of PWE. The enclosure accepts a standard electrical fitting. The UPE is equipped with a service entrance mounted in the small compartment at the bottom of the enclosure. The PME and PWE are equipped with a circuit breaker assembly located in the enclosure's module compartment. UPE/M is equipped with a dedicated utility raceway.

IMPORTANT NOTE: A high-magnetic 15 Amp circuit breaker must be used in order to accommodate the high inrush currents normally associated with the start-up of ferroresonant transformers (400 Amp, no-trip, first-half cycle). Do not replace this breaker with a conventional service entrance breaker.

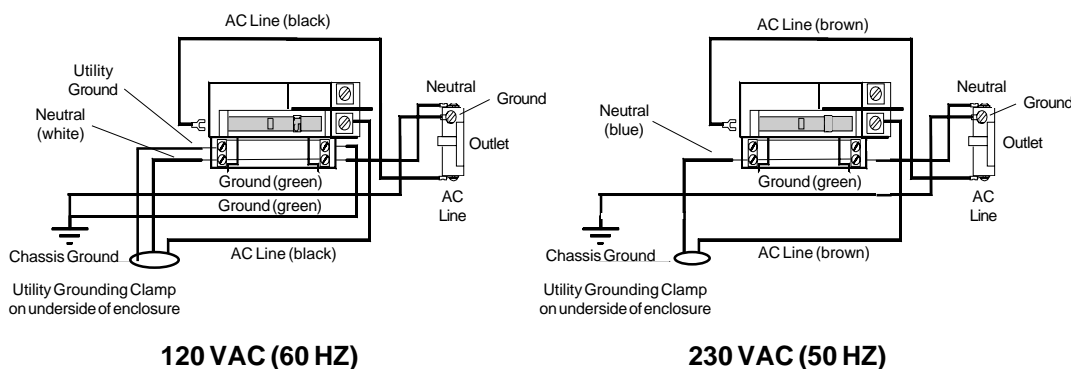
High-magnetic circuit breakers for Square D service entrances are available from Alpha Technologies.

Description	Alpha Part No.	Square D
High Inrush Breaker	470-013-10	Q0115HM
Ext. Serv. Disconnect	020-085-10	Q02-4L70RB

Wiring: (From duplex receptacle to service disconnect)

Alpha enclosures are equipped with a duplex receptacle to provide power to the UPS and other peripheral equipment. The receptacle should be protected by a 15 Amp, high magnetic circuit breaker located inside the service disconnect. The receptacle's hot side (black) is wired to the circuit breaker. The neutral (white) and ground (green) connect to the service disconnect's neutral bus. A grounding clamp, located on the enclosure, facilitates dedicated grounding. Note: Refer to the drawings at the back of the manual for detailed wiring information.

In most cases, this configuration qualifies for service entrance use, however, other codes may apply. Always contact your local utility to verify that the wiring conforms to applicable codes.



Typical Circuit Breaker Assembly

6. INSTALLATION

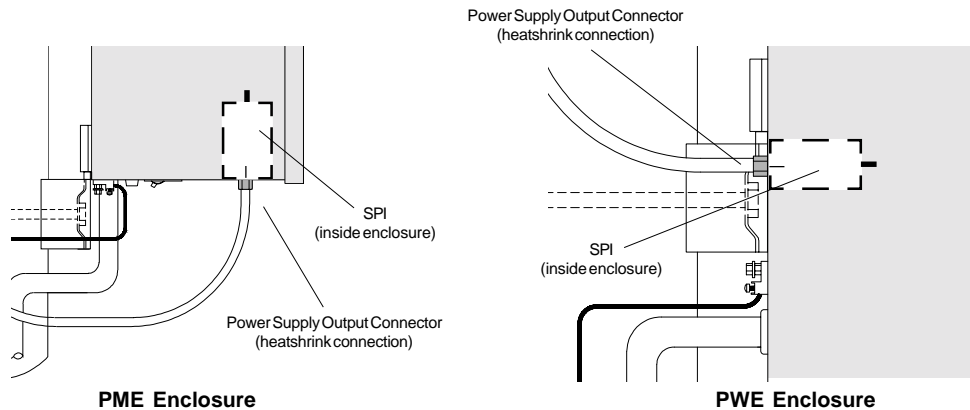


6.5 Connecting the SPI (Service Power Inserter)

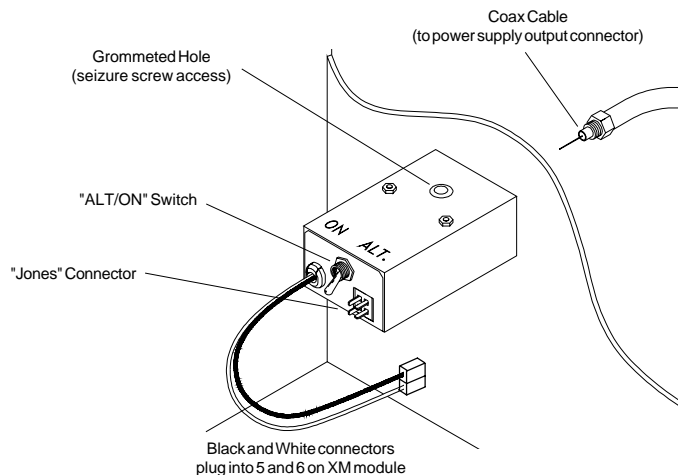


Procedure: (Refer to SPI drawing located at the back of the manual)

1. Prepare the incoming coaxial cable.
2. Remove the two screws from the Service Power Inserter and lift off the cover.
3. Loosen the seizure screw on the PCB, (located inside the SPI), to accommodate the center pin of the cable connector.
4. Screw the connector into the output port located on the rear of the PWE or UPE/M (or lower compartment of the PME or UPE) enclosure. Make sure the center pin slides through the seizure screw assembly. Heat shrink the external connection.
5. Tighten the seizure screw on the SPI so that the center pin on the cable connector is firmly clamped. If a connection is left loose, arcing could result and possible damage to the connector or SPI could occur.
6. Replace the cover on the SPI. NOTE: Make sure that the screws securing the SPI's internal PCB to its chassis are tight; otherwise, loss of power, arcing, or possible damage can occur. During routine maintenance, the seizure screw assembly can be accessed through the grommated hole without removing the SPI's cover.
7. Once the module has been installed in the enclosure, the SPI connects to the AC OUTPUT connector #5 (White) and #6 (Black) on the XM side panel (See section 6.6).
8. Make sure that the "ALT/ON" switch, located on the Service Power Inserter, is in the "ON" position. When the switch is in the "ALT" position, the input is transferred to the SPI's "Jones" connector which is used with an alternative power source such as the Alpha APP60S Service Power Supply during module maintenance or replacement.



Cable Connection to SPI



SPI Service Power Inserter
(shown in PWE enclosure)



6.6 Power Module Installation

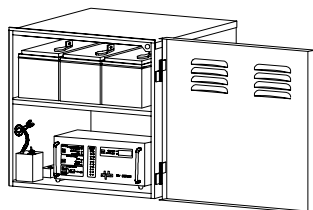


XM Series power modules are placed in the lower-right compartment of PME enclosures; the upper-right compartment of PWE, UPE and UPE/M enclosures. The enclosure's lid lifts and the door(s) can be removed. (Refer to the Module and Battery Placement drawings located at the back of the manual).

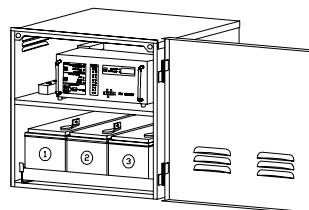
Procedure:

1. Set the XM Series power module on the enclosure's shelf.
2. Plug the connector from the SPI (Service Power Inserter) into the module's "AC OUTPUT" connector. Make sure that the SPI's "ALT/ON" switch is in the ON position. NOTE: If the installation includes an ACI lamp option, plug the lamp's connector into the module's "AC OUTPUT"; then, plug the SPI into the second connector on the ACI.
3. Switch the module's "BATTERY" circuit breaker OFF. This will prevent the inverter from starting when the batteries are first connected to the unit. Note: Do not switch the battery breaker ON until the power module is running on utility AC.
4. Plug the quick connects from the battery cable into the module's "BATTERY" connector. The connectors are keyed and color-coded to fit in one direction only.
5. If an optional LRI lamp (Local and Remote Indicator) is included, plug its cable into the module's "REMOTE INDICATOR LAMP" connector.
6. If remote alarms are included in the installation, the cable should be plugged into the module's "STANDBY STATUS RELAY" connector. White (1) is configured common; Red (2) is configured "normally open" (contacts close when alarm is present). The contact can be configured "normally closed" (contacts open when alarm is present) by moving the wire located on the module's back plane board from P104 to P105.
7. If the module is equipped with a Remote Temperature Sensor, plug the connector into the RTS port (above the data port) located on the main circuit module assembly. Route the sensor end of the cable into the battery compartment (see section 6.7).

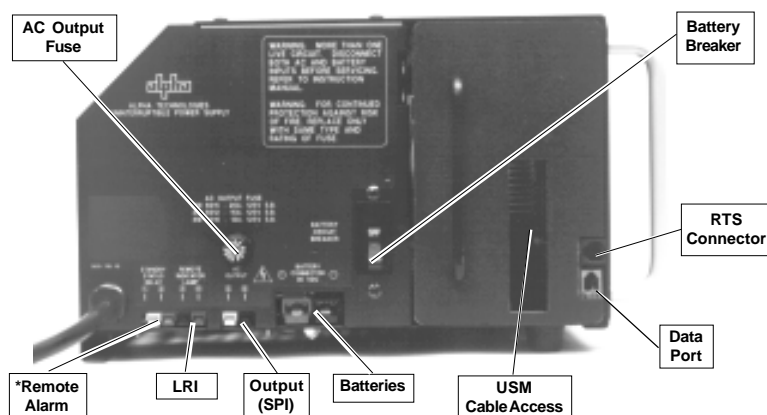
NOTE: VERIFY BATTERY CHARGE VOLTAGES (SECTION 6.9) BEFORE STARTING THE POWER SUPPLY.



PME Enclosure



PWE Enclosure
(same placement for UPE and UPE/M)



XM Series Power Module



6.7 Battery Installation and Wiring

WHENEVER INSTALLING OR REPLACING BATTERIES, DO NOT ALLOW LIVE BATTERY WIRES TO CONTACT THE ENCLOSURE OR THE POWER MODULE CHASSIS. Insulate any exposed wire ends with electrical tape. Shorting battery wires could result in a fire or possible explosion. Make sure that the power module's battery circuit is deactivated by switching the battery breaker OFF, or removing the battery fuse.

WEAR EYE PROTECTION WHENEVER WORKING WITH BATTERIES.

MAKE SURE THAT ALL BATTERY TERMINAL CONNECTIONS ARE TIGHT. One major battery manufacturer recommends that terminal connectors be torqued to 75 inch-pounds at installation and then re-torqued to 60 inch-pounds during routine maintenance. Loose connections will cause the unit to operate improperly. Use an approved battery terminal coating such as NCP-2 to protect the terminals. If custom battery cables are made, they should be #8 AWG or larger and as short as practical. Battery terminals should be checked for corrosion and cleaned if necessary.

CHECK BATTERY POLARITY. Polarity identifications are clearly marked at the module's battery connector. A single battery connected backwards may go unnoticed until it is required to perform. In the event polarity becomes accidentally reversed at the batteries, the battery circuit breaker will trip to protect the module.

IN ADDITION TO VOLTAGE CHECKS, ALWAYS INSPECT BATTERIES FOR SIGNS OF CRACKS, LEAKS OR SWELLING. If a battery has one or more defective (shorted or high impedance) cells, erratic operation or failure to provide standby power will result.

ALWAYS USE NEW BATTERIES WHEN FIRST INSTALLING A POWER SUPPLY. VERIFY THAT THEY ARE THE SAME TYPE OF BATTERY WITH AN IDENTICAL DATE CODE.

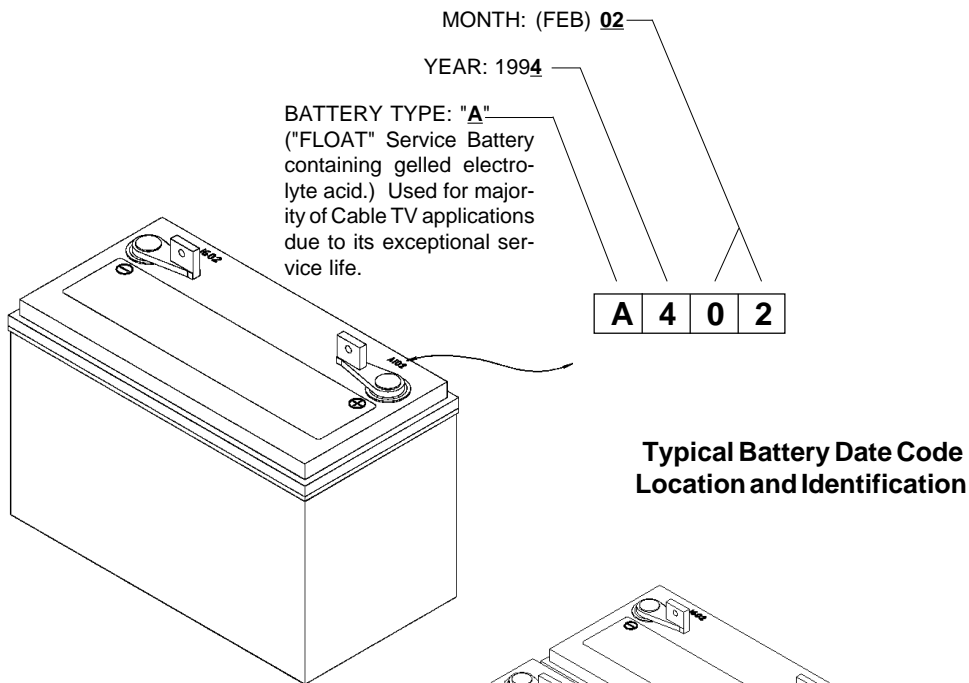
NEVER INSTALL OLD OR UNTESTED BATTERIES.

Whenever batteries have been in storage for more than 3 months, they should be recharged for (at least) 24 hours and checked under load prior to installation. Batteries with date codes older than 2 years should not be used unless thoroughly recharged and tested.

Procedure: (Refer to the Battery Wiring drawing located at the back of the manual)

1. Place the batteries with the positive terminals forward on the enclosure's shelf or slide tray. Position the batteries with maximum ventilation space between them (+/- 1").
2. Interconnect the three batteries in series (negative to positive). The optional in-line fuse if included, should be connected to the positive terminal on the right-hand battery.
3. Switch the module's battery breaker OFF to deactivate the DC circuit. Insert the battery cable's red and black quick-connects into the module's color-coded connector. Route the lugged ends of the cable through the grommets in the enclosure's shelf and into the battery compartment. Connect the red cable (+) to the positive terminal of the left-hand battery. Connect the black cable (-) to the negative terminal of the right-hand battery.
4. Use a voltmeter to verify polarity and DC voltage at the module's battery connector.
Caution: Whenever making or breaking battery connections, never allow live battery cables to contact the chassis. If necessary, wrap the lugs with electrical tape to prevent arcing and temporarily disconnect one of the leads from the center battery.
5. Number the batteries 1 - 3 (left to right) using labels or masking tape. Record each battery's number and date code in the power supply's maintenance log.
6. The charger utilizes a remote temperature sensor (RTS) to provide precise battery charger temperature compensation information. Uncoil the cable and plug the connector into the (upper) jack on the Main Module Assembly. The connector is keyed and fits in one direction only. Route the sensor end of the cable into the battery compartment and attach it to the side of the center battery using a high-strength adhesive tape (see opposite page). In the event the sensor is disconnected, a secondary sensor located on the main board provides temperature compensation based upon ambient temperature.

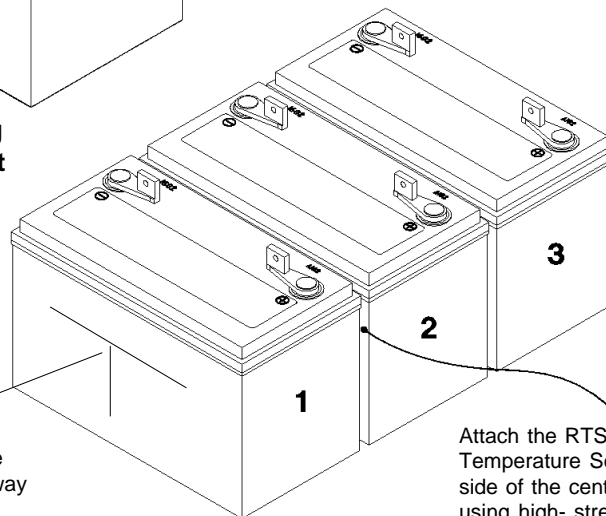
Do not reset the battery breaker until the module is running on AC LINE power.



Battery Numbering and RTS Placement

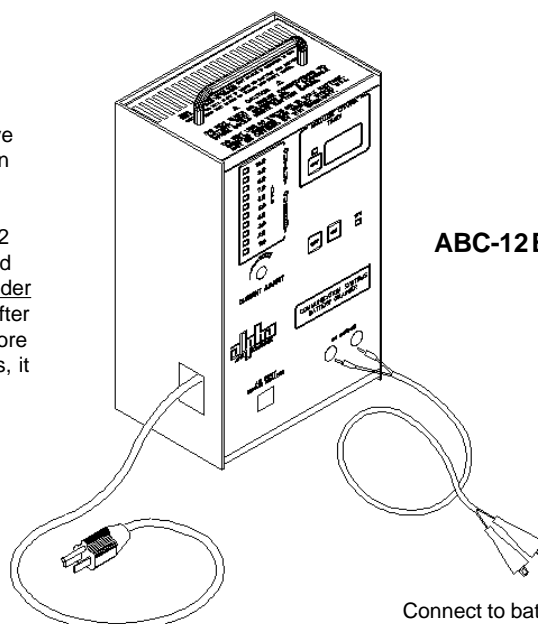
Number the batteries inside the enclosure, 1 - 3 (left to right), for easy identification.

Note: The sensor should be placed approximately mid-way on the side of the center battery, 2/3rds of the way up from the base.



Attach the RTS Battery Temperature Sensor to either side of the center battery using high-strength adhesive tape.

Whenever new batteries have been in storage for more than 3 months, they should be recharged for (at least) 24 hours using an Alpha ABC-12 battery charger. They should then be thoroughly tested under load prior to installation. If, after charging, a battery varies more than 0.3 VDC from the others, it should not be used.



ABC-12 Battery Charger

6. INSTALLATION



6.8 Main Circuit Module Removal and Installation

The XM Series power module comes with a field-replaceable, main circuit module assembly containing the standard control logic. It is designed to accept APM (Automatic Performance Monitor) and USM (Universal Status Monitor) plug-in logic upgrades to facilitate self-testing and status monitoring. The removable module is located on the left side of the unit.

CAUTION: ALWAYS SWITCH THE BATTERY BREAKER OFF PRIOR TO REMOVING OR INSPECTING THE MAIN CIRCUIT MODULE ASSEMBLY.

DO NOT REMOVE THE MODULE ASSEMBLY DURING INVERTER OPERATION.

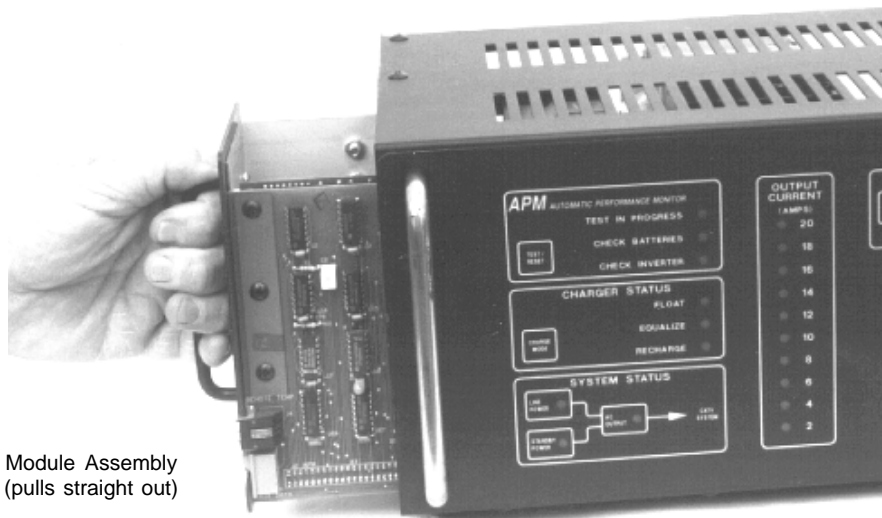
HANDLE THE CARD ASSEMBLY WITH EXTREME CARE. CIRCUIT BOARDS AND LOGIC UPGRADES ARE STATIC-SENSITIVE AND SUSCEPTIBLE TO DAMAGE. HANDLE THE CARD ASSEMBLY WITH EXTREME CARE. CIRCUIT BOARDS AND LOGIC UPGRADES ARE STATIC-SENSITIVE AND SUSCEPTIBLE TO DAMAGE.

WHEN RE-INSTALLING THE MODULE, MAKE SURE THE CARD EDGE CONNECTOR IS FIRMLY SEATED IN THE BACK PLANE ASSEMBLY.

Procedure:

1. To remove the main module assembly, grasp the handle on the left side of the unit. Pull firmly to release the module from the back plane assembly. Gently slide the module assembly straight out. It is designed so that the board can be removed while the power supply is operating on AC line power.
2. Verify that the correct battery charge voltages are selected (section 6.9). If an APM or USM logic upgrade is included, "Auto-Equalize" and "Auto-Test" switches must be set (section 6.10).
3. To reseat the main circuit module assembly, align it with the card guides and gently slide it back into the back plane assembly. Press the assembly firmly to seat it into the card edge connector.

NOTE: THE MODULE ASSEMBLY CAN BE REMOVED WHILE THE POWER SUPPLY IS RUNNING ON LINE POWER. IT WILL CONTINUE TO OPERATE AS A NON-STANDBY POWER SUPPLY.



Module Assembly
(pulls straight out)

Main Circuit Module

6.9 Standard Control Logic

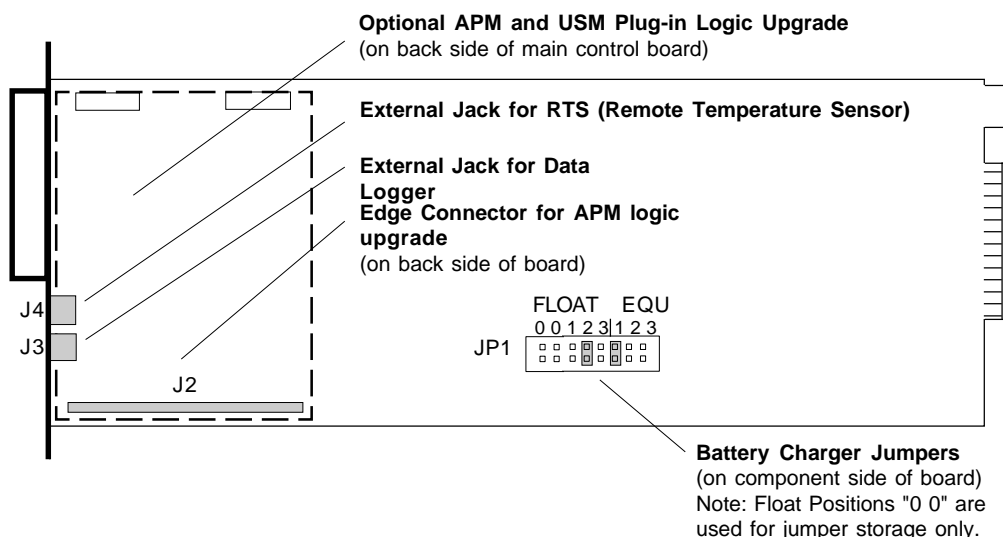
The Main Circuit Module assembly comes equipped with circuitry to monitor incoming AC, charge the batteries and control the inverter. The XM Series power module uses a dual-mode (float and equalize) temperature compensated battery charger to maintain the batteries. A Remote Temperature Sensor (RTS) plugs directly into the side of the module (the other end is attached to the side of the center battery in the battery compartment) to provide optimum temperature measurements. Battery charging voltages are factory set and do not need to be reset unless the module assembly has been repaired or has been tampered with, or when batteries (other than gelled-electrolyte) are being used. NOTE: Always verify the battery charger switch settings before placing the unit into service. The power module can be manually sequenced through its two charging modes by pressing the front panel "CHARGE MODE" switch. The XM's front panel "CHARGER STATUS" display indicates the charging mode.

6.9.1 Selecting Battery Charge Voltages

Always refer to the battery manufacturer's specifications before selecting float and equalize charge settings. Failure to do so could damage the batteries.

Procedure:

1. Remove the Main Circuit Module assembly from the left side of the power module.
2. Select the required float charge voltage by positioning the FLOAT jumper at JP1 located midway along the lower side of the main board (see illustration on below).
The jumper is factory set at FLOAT 2 (40.5V) for a 36 Volt battery string and can be repositioned if necessary. Each position (FLOAT 1, 2, 3) provides a different voltage (refer to the chart on the next page for 24 VDC, 36 VDC and 48 VDC applications). If the jumper is removed, the float voltage will default to its 39.0 volt calibration level.
3. Select the required equalize charge voltage by positioning the EQU jumper located at JP1 on the main board. The EQUALIZE jumper adds 0.9V per setting above the value of the FLOAT setting. **The jumper is factory set at EQU 1 (0.9V)** and can be repositioned if necessary. Each position (EQU 1, 2, 3) will provide a different equalize voltage (refer to the chart on the next page for 24 VDC, 36 VDC and 48 VDC applications). If the jumper is removed, the equalize voltage will default to 0.0 volts (39.0 volt float calibration level).
4. If the unit is equipped with APM or USM logic upgrades, set the "Auto-Equalize" and "Auto-Test" switches (section 6.10) before reseating the Main Circuit Module assembly.



Main Circuit Module Assembly

6. INSTALLATION



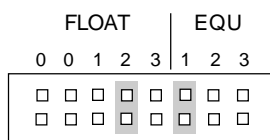
6.9 Standard Control Logic, *continued*

6.9.2 Float and Equalize Chart

Values given for 36V systems calculated at 77°F (25°C)

Example:

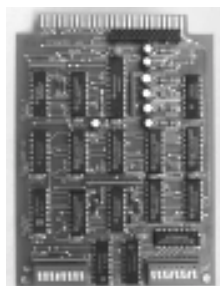
If a particular battery manufacturer calls for a FLOAT of 40.5 volts and EQUALIZE of 41.4 volts, the board's FLOAT jumper is set to FLOAT "2" (40.5 volts). The board's EQUALIZE jumper is set to EQU "1" (0.9 volts). This results in a FLOAT charge of 40.5 volts with an EQUALIZE charge of 41.4 volts (40.5 volts + 0.9 volts = 41.4 volts).



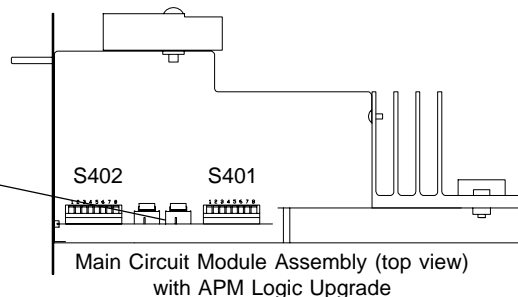
Jumpers JP1

FLOAT					EQUALIZE				
Jumper position	24V Batt	36V Batt	48V Batt	VDC per cell	Jumper position	24V Batt	36V Batt	48V Batt	VDC per cell
Default	26.0	39.0	52.0	2.167	Default	0.0	0.0	0.0	0.000
FLOAT 1	26.4	39.6	52.8	2.200	EQ 1	0.6	0.9	1.2	0.050
FLOAT 2	27.0	40.5	54.0	2.250	EQ 2	1.2	1.8	2.4	0.100
FLOAT 3	27.6	41.4	55.2	2.300	EQ 3	1.8	2.7	3.6	0.150

Alpha Technologies does not assume responsibility for batteries damaged by improper jumper settings. Always consult the battery manufacturer for correct charging levels. If batteries appear to be over or under-charged, first check for defective batteries and then verify the correct charge voltage settings.



S402 S401



S402 (TEST)

1 2 3 4 5 6 7 8			
<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			
INTERVAL (in days)		DURATION (in minutes)	
60 Hz	50 Hz	60 Hz	50 Hz
1. 6.1	7.3	5. 4.3	5.2
2. 12	14.5	6. 8.5	10.2
3. 24	29	7. 17	20.4
4. 48	57.6	8. AOEQ	AOEQ

S401 (EQU)

1 2 3 4 5 6 7 8			
<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			
INTERVAL (in days)		DURATION (in minutes / hours)	
60 Hz	50 Hz	60 Hz	50 Hz
1. 3	3.6	5. 17	20.4
2. 6	7.3	6. 34	40.8
3. 12	14.5	7. 1.2 H	1.4 H
4. 24	29	8. 2.3 H	2.8 H

APM LOGIC UPGRADE



6.10 APM (Automatic Performance Monitor)

The APM is a field-replaceable logic upgrade that allows the XM Series power module to self-test the inverter and batteries at pre-determined intervals and durations. It also allows the battery charger's equalize voltage (interval and duration) to be pre-selected to further optimize battery performance. The APM logic card plugs directly onto the main control board at connector J2 (see illustration on previous page). Note: The Main Circuit Module assembly must be completely removed from the power module when installing the APM.

6.10.1 APM "Auto-Test" Interval and Duration Selection

Select self-test interval and duration settings at switch (S402) located on the APM logic card (see previous page). Positions 1, 2, 3 or 4 determine the test intervals; positions 5, 6 or 7 determine the test duration. When a DIP switch is in the ON position, the mode is activated. If none of the switch positions are selected, the mode reverts to its default setting (manual test only: 34 minute test duration on 60 Hz models; 40.8 minutes on 50 Hz models). If two switch positions are accidentally selected for either interval or duration (i.e., 6 and 7), the mode reverts to the lower of the two settings. Note: DIP switch #8 is used only to activate the "After Outage Equalize" (AOEQ) feature.

6.10.2 APM "Auto-Equalize" Interval and Duration Selection

Equalize increases the normal battery recharge voltage by the amount selected at the main board jumpers (Section 6.9.2). This feature is used to automatically send an equalize voltage to the batteries at predetermined intervals and durations. It is extremely useful in maintaining equal charges among individual battery cells.

Select Auto-Equalize interval and duration settings at switch (S401) located on the APM logic card (see previous page). Positions 1, 2, 3 or 4 determine the equalize intervals; positions 5, 6, 7 and 8 determine the equalize duration. When a DIP switch is in the ON position, the mode is activated. If none of the switch positions are selected, the mode reverts to its default setting (manual equalize only: 2.3 hour equalize duration on 60 Hz models; 2.8 hour equalize duration on 50 Hz models). If two switch positions are accidentally selected for either interval or duration (i.e., 3 and 4), the mode reverts to the lower of the two settings.

The APM logic upgrade is also equipped with an "After Outage Equalize" (**AOEQ**) feature that automatically activates equalize mode after every outage. This allows severely discharged batteries to be aggressively recharged after inverter operation to prepare for the next utility power outage. This feature is extremely useful in areas where long outages occur on a regular basis. AOEQ is activated by placing DIP switch #8 (S402) in the ON position. The AOEQ duration is determined by the duration setting on the equalize switch (S401). **CAUTION:** Possible battery damage can occur if used incorrectly. Always refer to the battery manufacturer's recommendations for equalize charging before selecting AOEQ.

Note: Interval and Duration settings must be selected. DIP switches must be in the ON position to activate the mode.

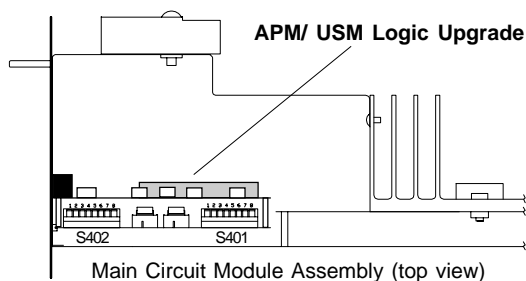
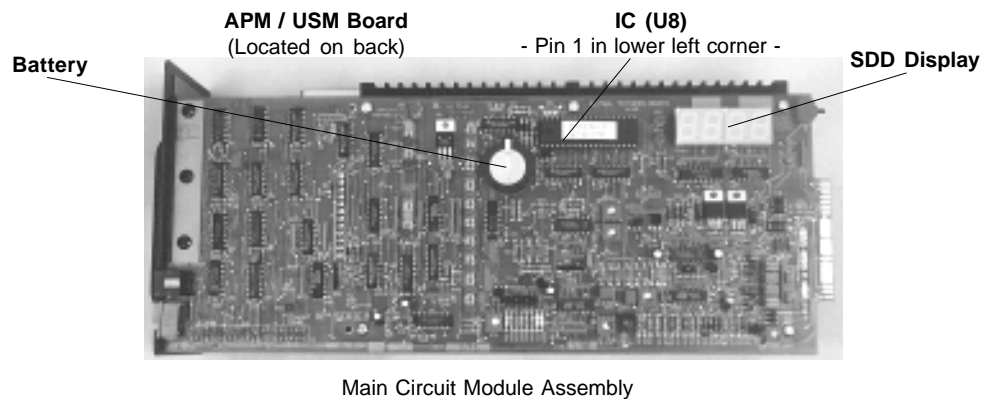
6. INSTALLATION

6.11 USM (Universal Status Monitor)

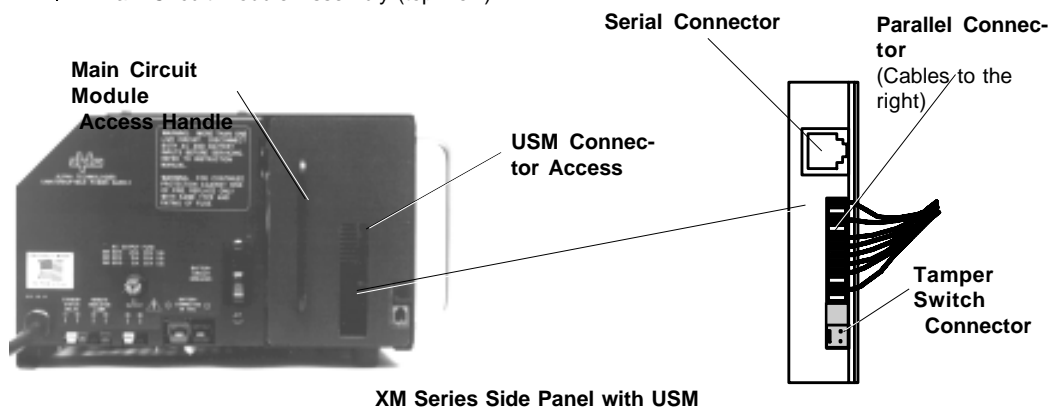
The optional, USM status monitoring upgrade plugs directly into the APM logic card.

Note: The Main Circuit Module assembly must be completely removed from the power module when installing the USM (see section 6.8). Status monitoring interfaces are listed according to their manufacturer, along with the associated parts. The USM can also accommodate a tamper switch assembly to indicate unauthorized enclosure entries.

1. Remove the APM logic card from the Main Circuit Module assembly (if installed). Verify that the APM's Auto-Equalize and Self-test switches are in their desired positions (see section 6.10). Plug the USM logic card into connector J2 located on the component side of the APM card. Set the USM switches according to the status monitoring system you will be using (see opposite page). Plug the card into the Main Circuit Module assembly.
2. If a main board IC upgrade is included, carefully remove the IC (U8) from the main board assembly. Replace it with the one included with the USM upgrade kit. Position the IC with the notch to the left (pin 1 notch in the lower-left corner). Caution: The IC is static sensitive and can be easily damaged if not handled properly.
3. Reinstall the Main Circuit Module assembly. Note: Make sure the assembly slides straight in and seats firmly into the card edge connector. Plug the communications cable into the USM connector. Note: The cable fits in one direction only with the incoming cables to the right (see below). Test the unit for normal operation.



NOTE: THE UNIT CAN CONTINUE TO OPERATE AS A NON-STANDBY POWER SUPPLY WITH THE MAIN CIRCUIT MODULE REMOVED.



6.11 USM (Universal Status Monitor), *continued*

	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	SW4	SW1	SW2	SW3
USM-T, TEXSCAN 'VITAL SIGNS'	3	O	C	C	C	C	15V	1	1	P10 P11 P12 NOT USED			1	N/A	0	N/A	N/A	N/A
USM-AMT LL AM COMMUNICATIONS Labquest/JERROLD Lifeline	3	O	O	C	C	C	15V	1	1				1	N/A	0			
USM-C C-COR 'QUICK ALERT'	3	O	C	C	C	C	15V	1	1				1	N/A	0			
USM-J JERROLD 'RSM'	1	C	O	O	O	O	15V	3	3				3	3	1			
USM-M MAGNAVOX '6DSS'	3	O	O	C	C	C	5V	N/A	N/A				N/A	N/A	0			
USM-SA SCIENTIFIC ATLANTA '5587'	3	O	O	O	O	O	24V	1	1				3	1	0			
USM-ADC / SEG	3	C	O	C	C	C	5V	1	1				1	N/A	0			
USM-A 9600 BAUD (OBSOLETE)	N/A	N/A	N/A	N/A	N/A	N/A	15V	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0-9	0-9	1-9
USM-A 4800 BAUD	3	0													5			
USM-A 2400 BAUD	3	0													4			
USM-A 1200 BAUD	3	0													3			
USM-A 600 BAUD (OBSOLETE)	N/A	N/A													N/A			
USM-A 300 BAUD	3	0													2			
USM-AT AirTouch Teletrack	3	0													1			
USM-DIAG (OBSOLETE)	N/A	N/A													N/A			

KEY:

O = Open

C = Closed

1 = Short pins 1 & 2

3 = Short pins 2 & 3

SWITCH SETTINGS

Parallel Configurations:

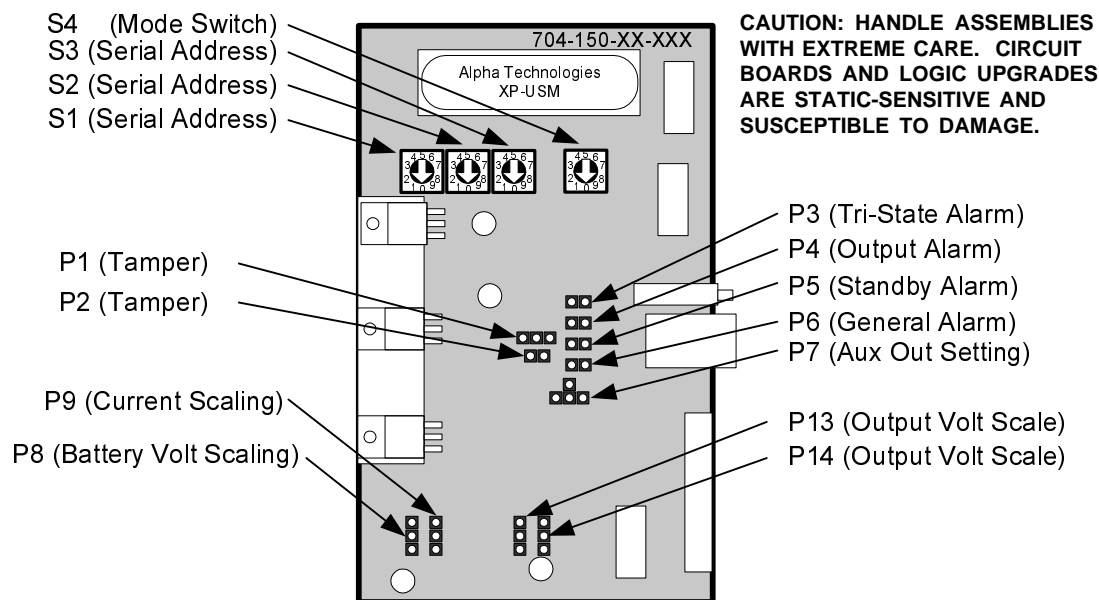
Address = 0; Mode = 0

Serial Configurations:

Address = 001-999; Mode = 1-6

Select the pin and switch settings according to your specific application.

Example: If configuring for a Jerrold RSM (USM-J): **P1** requires the jumper across pins 1 & 2; **P2** has the pin jumper closed; **P3**, **P4**, **P5**, **P6** have their pin jumpers open; **P7** is set to the 15V position; **P8**, **P9**, **P13**, **P14** require their jumpers across pins 2 & 3; **SW4** is set to 0.

**USM Pin Jumper and Switch Locations**

6. INSTALLATION

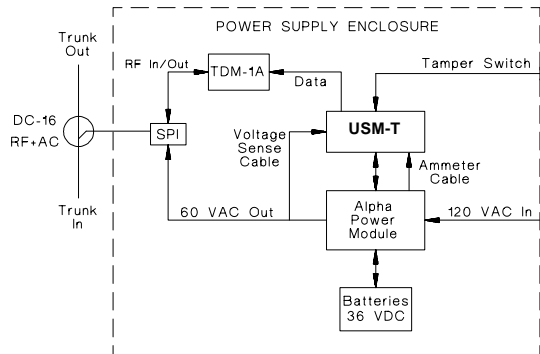


6.11 USM (Universal Status Monitor), *continued*

6.11.1 Parallel Configurations

USM-T (Texscan Vital Signs "TDM-1A" and "RTDM-1A")

Designed for systems utilizing Texscan TDM-1A transponders. Transponders are internally mounted in Alpha power supply enclosures.

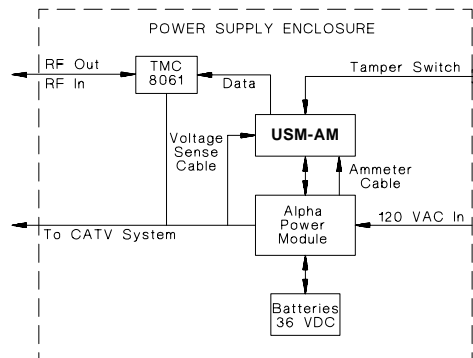


Select the following USM kit number according to your specific enclosure:

PWE	018-020-21-USM
PME	018-020-22-USM
UPE	018-020-23-USM
UPE/M	018-020-23-USM

USM-AM (AM Communications "LANguard")

Designed for systems utilizing AM Communications TMC 8061 transponders. Transponders are internally mounted in Alpha power supply enclosures.

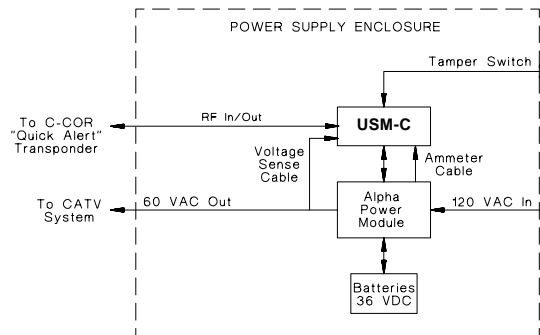


Select the following USM kit number according to your specific enclosure:

PWE	018-022-21-USM
PME	018-022-22-USM
UPE	018-022-23-USM
UPE/M	018-022-23-USM

USM-C (C-COR "Quick Alert")

Designed for systems utilizing C-COR "Quick Alert" transponders. The transponder is externally mounted in its own enclosure.



Select the following USM kit number according to your specific enclosure:

PWE	018-023-21-USM
PME	018-023-22-USM
UPE	018-023-23-USM
UPE/M	018-023-23-USM

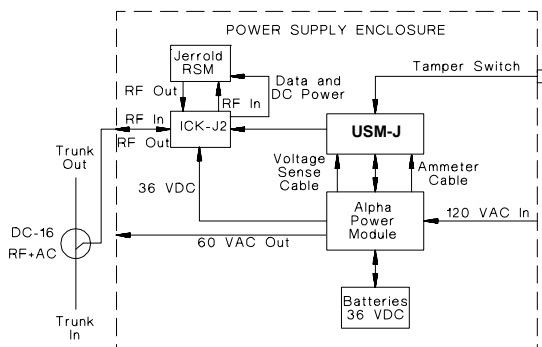
Order from C-COR:

5' data cable	172960-01
10' data cable	172960-02
20' data cable	172960-03
40' data cable	172960-04

6.11 USM (Universal Status Monitor), *continued*

USM-J (Jerrold "RSM")

Designed for systems utilizing Jerrold model "RSM" transponders. Transponders are internally mounted in Alpha power supply enclosures.



Select the following USM kit number according to your specific enclosure:

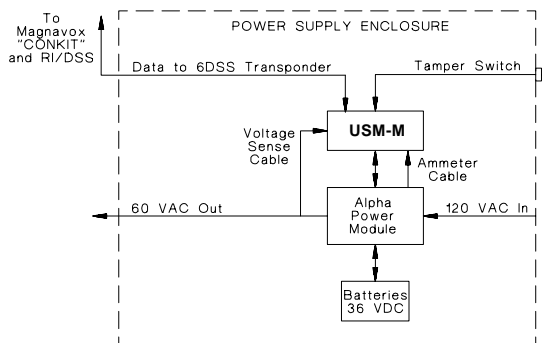
PWE	018-024-21-USM
PME	018-024-22-USM
UPE	018-024-23-USM
UPE/M	018-024-23-USM

Also order from Alpha:

ICK-J2	740-080-20-USM
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USM-M (Magnavox "6-DSS")

Designed for systems utilizing the Magnavox 6-DSS Digital Sentry System. The transponder is externally mounted in its own enclosure.



Select the following USM kit number according to your specific enclosure:

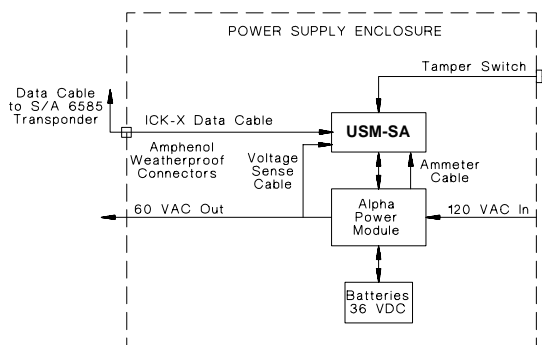
PWE	018-025-21-USM
PME	018-025-22-USM
UPE	018-025-23-USM
UPE/M	018-025-23-USM

Order from Magnavox:

CONKIT and RI/DSS
Data cable from USM to 6DSS

USM-SA (Scientific Atlanta "6585")

Designed for systems utilizing Scientific Atlanta, Model 6585 transponders. The transponder is externally mounted in its own enclosure.



Select the following USM kit number according to your specific enclosure:

PWE	018-026-21-USM
PME	018-026-22-USM
UPE	018-026-23-USM
UPE/M	018-026-23-USM

Also order from Alpha:

ICK-X	740-050-20-USM
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Order from Scientific Atlanta:

6585 data cable

6. INSTALLATION



6.11 USM (Universal Status Monitor), *continued*

6.11.2 Serial Configuration

USM-A

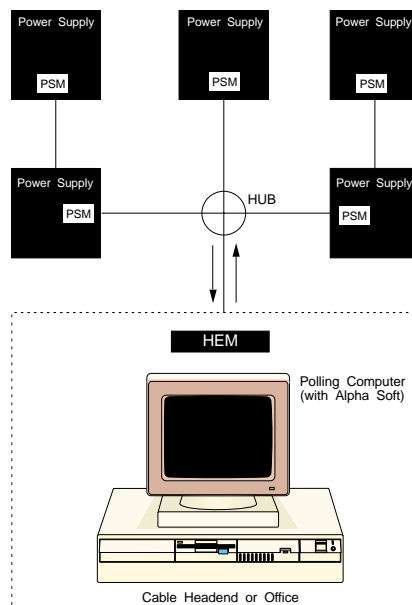
The USM, used in conjunction with Alpha's status monitoring software, allows the cable operator to remotely manipulate power supply functions, maintain precise data for fault logs and direct service personnel to the exact nature of most malfunctions. Using the simple and direct, menu-driven AlphaSoft program, vital power supply information such as High and Low Battery Warnings, Battery Fail, Inverter ON, AC Main Fail and other critical alarm conditions can be obtained instantaneously, thus greatly reducing overall operation and maintenance costs.

Computer commands are converted into modulated radio frequency signals by the HEM (Headend Modem) before being transmitted throughout the cable system. They are received by the PSM (Power Supply Modem) located at each power supply location and directed to the USM(-A) logic card. Power supply data is then re-transmitted back at sub-low frequencies.

When faults are detected, the information is displayed on the terminal and written to a dedicated file on the computer's hard drive or printer. The system consists of:

- XM Series Power Module
- USM(-A) Logic Upgrade
- RF Power Supply Modem (PSM)
- RF Headend Modem (HEM)
- Headend Computer (DOS compatible - 286 or higher)
- AlphaSoft Status Monitoring Software

A segment of the information transmitted between the power supply and the computer contains a binary address specific to each power supply in the system. The power supply address must be set using DIP switches located on the USM (see setting chart and switch location illustration on page 33). Each address must then be entered into the AlphaSoft program for access by the polling computer. The PSM interface cable plugs into the serial connector located on the USM card (see illustration on page 32).



Status Monitoring Using USM-A

OPERATION



7.1 XM Power Module Start-up and Testing

Once connections have been made to the power module, it should be tested for AC LINE and STANDBY operation before placing it into service. Note: The power module should always be started from utility AC (not batteries). This is because high inrush currents, associated with the start-up of ferroresonant transformers, could place unnecessary stress on the batteries.

7.1.1 AC Line Operation (LINE POWER)

1. Plug the module's power cord into the enclosure's AC convenience outlet and switch the AC circuit breaker ON. The green, front panel "LINE POWER" LED will light to indicate AC LINE operation. The green "AC OUTPUT" LED will light as well to indicate acceptable output voltage.
2. Wait at least 1 minute and then reset the battery breaker on the side panel.
3. Use a true RMS voltmeter to verify AC output at the module's AC OUTPUT connector. If a non-RMS voltmeter is used, the output reading can vary by as much as 10% due to the "quasi" square wave output of the ferroresonant transformer.
4. Check the module's front panel "OUTPUT CURRENT DISPLAY" to verify output current. Current is displayed in 2 Amp increments. When the output reading falls between increments, adjacent LEDs light.
5. Check the "CHARGER STATUS" block. If necessary, press the "CHARGE MODE" switch to place the charger into FLOAT. Once the green "FLOAT" LED lights, verify the voltage at the module's "BATTERY" connector. It should closely match the FLOAT setting on the main board assembly (section 6.9). Press the "CHARGE MODE" switch again to place the charger into EQUALIZE. Once the yellow "EQUALIZE" LED comes ON, verify the voltage at the "BATTERY" connector. The voltage should closely match the "EQU" setting on the main circuit board assembly (section 6.9). Note: The battery charger is temperature-compensating so the voltages may vary slightly, depending upon temperature. If the red "RECHARGE" LED is ON, the batteries will be drawing more than 5 Amps of charge current.
6. On units equipped with an APM logic upgrade, press the "TEST/RESET" button located in the APM status block to put the unit into self-test. The yellow "TEST IN PROGRESS" LED will come ON. If the logic card detects a problem, it will flash the red "CHECK BATTERIES" or "CHECK INVERTER" LED to indicate the circuit that has failed self-test. Press the "TEST/RESET" button once to cancel and return the module to AC LINE operation.

7.1.2 Inverter Operation (STANDBY)

1. With the unit operating from AC LINE power, indicated by the green "LINE POWER" and "AC OUTPUT" LEDs, switch the AC circuit breaker to OFF. The green "LINE POWER" LED will go out and the red "STANDBY POWER" LED will come ON to indicate inverter operation.
2. Use a true RMS voltmeter to verify AC at the module's "AC OUTPUT" connector.
3. Return the unit to AC LINE operation by switching the AC circuit breaker to ON. The green "LINE POWER" LED will light, indicating that AC LINE power is again available. It then takes 10 to 50 seconds for the unit to completely transfer back to utility power. This delay allows the utility voltage and frequency to stabilize before the module's phase-lock circuitry is activated. The module then synchronizes the inverter's waveform to the utility's before initiating a smooth, in-phase transfer back to utility power. Once the transfer is complete, the red "STANDBY POWER" LED will go out.
4. The XP Series power supply is now fully operational.

7. OPERATION

7.2 Identifying Modes of Operation

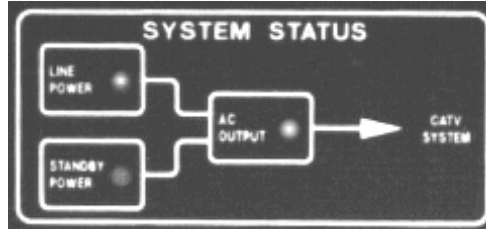
In order to fully understand the power supply functions, it is important to recognize the modes of operation indicated by the LEDs in the front panel SYSTEM STATUS, CHARGER STATUS, and optional APM blocks.

7.2.1 System Status Block

The SYSTEM STATUS block indicates the utility and battery input status, plus verifies the output of the power supply. The green AC OUTPUT LED should remain ON at all times.

7.2.1.1 AC LINE Operation

LINE POWER
LED (green) ON

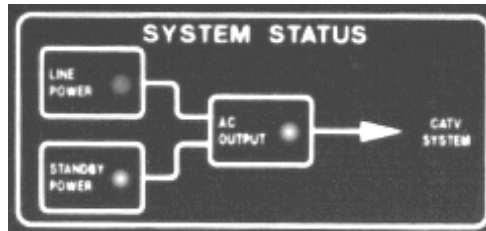


AC OUTPUT
LED (green) ON

Indicates Line operation with the power module operating on utility power. Power is available from the utility and acceptable voltage is present at the output.

7.2.1.2 STANDBY Operation

STANDBY POWER
LED (red) ON



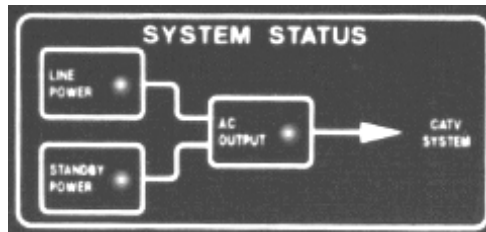
AC OUTPUT
LED (green) ON

Indicates Inverter operation using the batteries and inverter. Standby power is available from the batteries and acceptable voltage is present at the output.

7.2.1.3 TRANSFER or SELF-TEST Mode

LINE POWER
LED (green) LED ON

STANDBY POWER
LED (red) ON



AC OUTPUT
LED (green) ON

On standard XM units:

When all three LEDs are ON at the same time, the power module is in its transfer mode, preparing to transfer back to AC LINE power. The complete re-transfer takes approximately 10 to 50 seconds to ensure that incoming voltage and frequency has stabilized, and to allow the module to synchronize wave forms with the utility. When the transfer is complete, the red "STANDBY POWER" LED will go out.

Units equipped with APM or USM logic upgrades:

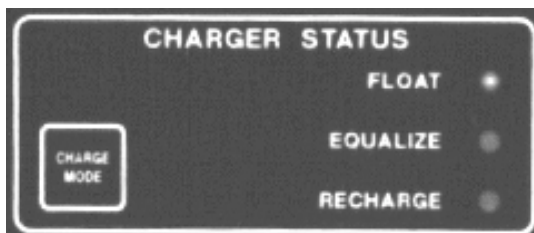
When all three LEDs are ON at the same time, the unit is in either its self-test or transfer mode. Check the yellow LED marked "TEST IN PROGRESS" in the APM block. If the LED is ON, the power module is in its self-test mode; if the LED is OFF, the power module is preparing to transfer back to AC LINE operation.

7.2 Identifying Modes of Operation, *continued*

7.2.2 Charger Status Block

The CHARGER STATUS block indicates the battery charging modes: FLOAT, EQUALIZE or RECHARGE. During AC LINE operation, the green "FLOAT" LED remains ON.

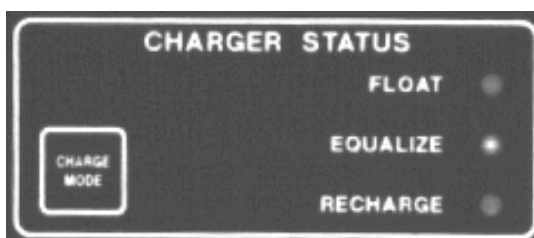
7.2.2.1 FLOAT Mode



FLOAT
LED (green) ON

Indicates that the batteries are being FLOAT charged.

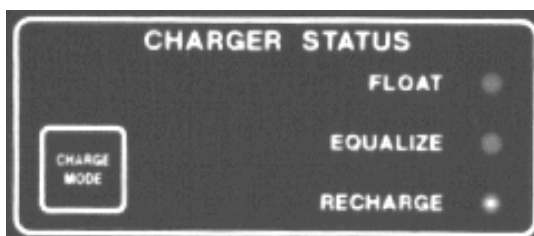
7.2.2.2 EQUALIZE Mode



EQUALIZE
LED (yellow) ON

Indicates that the batteries are receiving an EQUALIZE charge. On the standard XP Series power supplies, EQUALIZE can only be activated by pressing the "CHARGE MODE" switch.

7.2.2.3 RECHARGE Mode



RECHARGE
LED (red) ON

Indicates that the batteries are drawing more than 5 Amps of current from the charger. Note: On units equipped with APM or USM logic upgrades, either the "FLOAT" or "EQUALIZE" LED will also be ON during RECHARGE, depending upon the charger's mode.

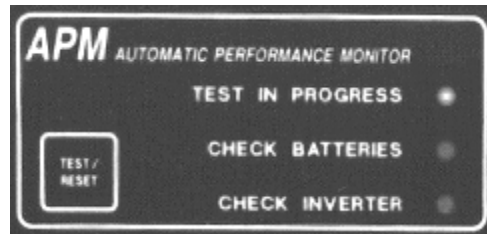
7. OPERATION

7.2 Identifying Modes of Operation, *continued*

7.2.3 APM (Automatic Performance Monitor) Status Block

On units equipped with an APM logic upgrade, the power module automatically self-tests the batteries and inverter at pre-selected intervals. If a failure is detected, either the red "CHECK BATTERIES" or red "CHECK INVERTER" LED in the APM status block will flash to indicate the circuit (AC or DC) that has failed.

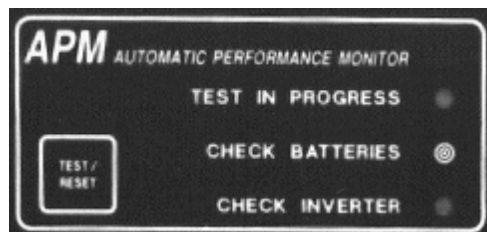
7.2.3.1 SELF-TEST Mode



TEST IN PROGRESS
LED (yellow) ON

The yellow "TEST IN PROGRESS" LED indicates that the unit is in self-test mode.

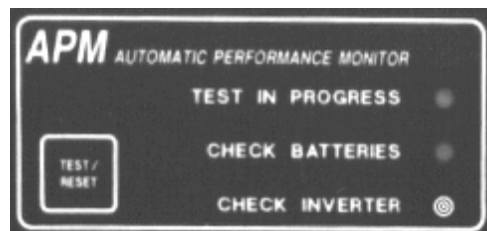
7.2.3.2 BATTERY FAILURE



CHECK BATTERIES
LED (red) FLASHING

Indicates that one or more of the batteries are unable to carry the load and that maintenance is required. Under this condition, the power supply will not be able to support inverter operation. (Refer to Maintenance 8.8.2).

7.2.3.3 INVERTER FAILURE



CHECK INVERTER
LED (red) FLASHING

Indicates that the inverter has failed to produce AC and that maintenance is required. Under this condition, the power supply will not be able to support inverter operation. (Refer to Maintenance 8.8.3).

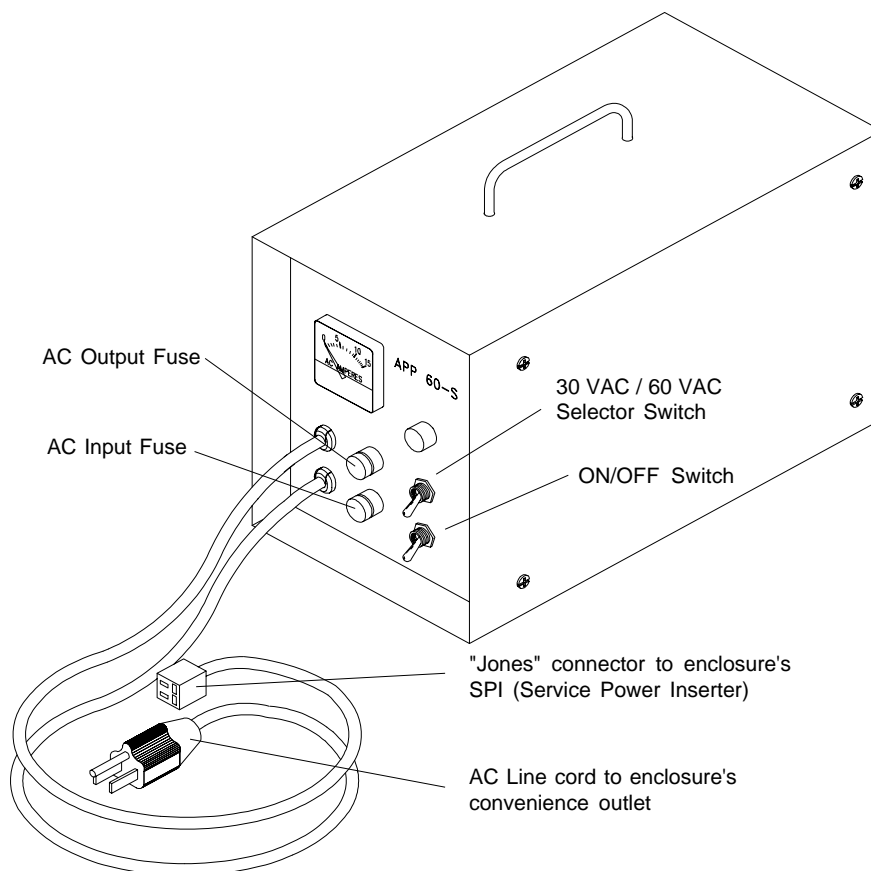
NOTE: If the enclosure's external LRI lamp is flashing, indicating that the power supply requires service, it can be cleared by pressing the "TEST/RESET" switch once; however, the front panel LEDs, "CHECK BATTERIES" or "CHECK INVERTER", cannot be cleared until the fault is corrected.

7.3 Power Module Shutdown

When a power module needs to be removed from service, an Alpha APP60-S Service Power Supply is recommended as an alternate non-standby power source to prevent interruption to the cable plant. Note: When powering down a module, always switch the battery breaker OFF before removing AC, otherwise the module will transfer into inverter operation.

Procedure

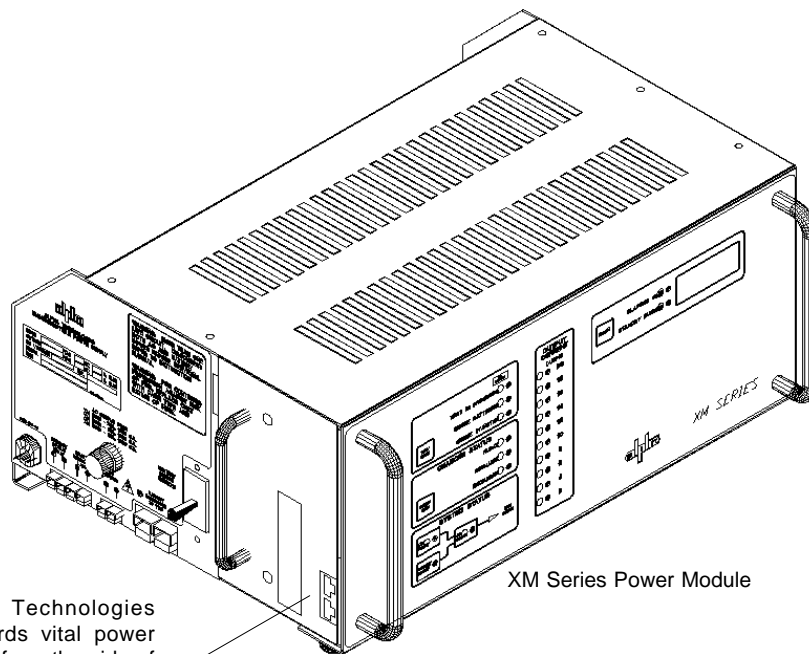
1. Plug the APP60-S "Jones" connector into the SPI (Service Power Inserter).
2. Plug the APP60-S power cord into the enclosure's convenience outlet. Switch the APP60-S ON. Note: Verify that the 30 / 60 VAC selector is in the desired position.
3. Toggle the switch on the SPI from "ON" to "ALT".
4. Switch the battery breaker on the side panel of the XM Series module OFF.
5. Unplug the XM Series module's power cord from the enclosure's convenience outlet.
6. Wait approximately 1 minute for the module's capacitors to fully discharge.
7. Remove the cables from the module's side panel connectors.
8. Carefully slide the power module out of the enclosure. CAUTION: The ferroresonant transformer generates heat and may cause burns if handled with bare hands.
9. Reverse this procedure, when re-installing a module. Always test the power module before toggling the SPI's switch from "ALT" to "ON".



APP60-S Service Power Supply

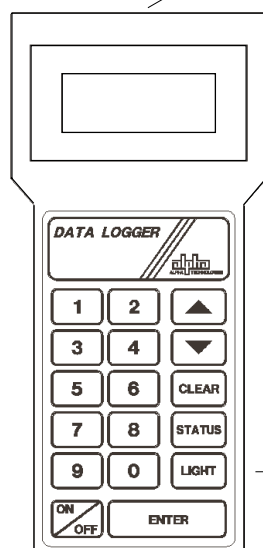
8. MAINTENANCE

By automating data retrieval, log entry and consistent data formatting, overall maintenance time can be significantly reduced. Data, such as Input Line Voltage, Output Current, Battery Voltage, Battery Charge Voltage (float and equalize), Battery Charge Current, Inverter Events, Accumulated Inverter Run Time, Technician ID Number, Power Supply Address, Test Date and Time, can be retrieved and stored in the DataLogger.



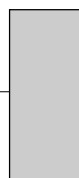
XM Series Power Module

The Alpha Technologies "DataLogger" records vital power supply data directly from the side of the power module.

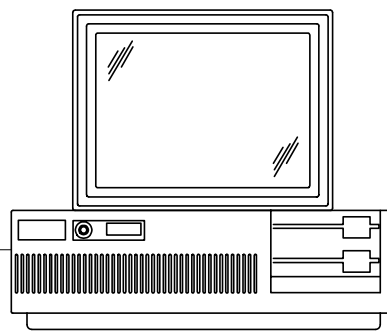


DataLogger

Accumulated data can be downloaded, using a RS-232 serial interface located in the DataLogger's charger stand, to an IBM® PC or compatible computer at the CATV office or headend.



DataLogger
Charger Stand



DOS Compatible Computer

Preventive Maintenance using the optional DataLogger

MAINTENANCE



Maintenance should be performed every three to six months. If the power module fails to perform a specific function, refer to the troubleshooting chart. By establishing a routine maintenance program and following the guidelines contained in this manual, the XP Series power supply will continue to provide years of trouble-free operation.



Care of the batteries should be the first step in any power supply maintenance program. In addition to voltage checks, visually inspect the batteries for signs of cracks, leaks or swelling. To aid in quick identification and tracing of voltages in the maintenance log, number the batteries inside the enclosure using labels or masking tape, etc. Because of a battery's chemical composition, it is temperature sensitive and susceptible to over and under-charging. Since batteries behave differently in the winter than they do in the summer, Alpha logic cards automatically compensate for changes in temperature by adjusting float and equalize charge voltages.



SAFETY PRECAUTIONS

THE POWER SUPPLY SHOULD BE SERVICED ONLY BY QUALIFIED PERSONNEL.



USE A BUCKET TRUCK, OR SUITABLE SAFETY EQUIPMENT (SAFETY HARNESS AND CLIMBING SPIKES), WHEN SERVICING POLE-MOUNT INSTALLATIONS.

USE HEAVY GLOVES WHEN HANDLING A POWER MODULE THAT HAS JUST BEEN TAKEN OUT OF SERVICE. THE FERRORESONANT TRANSFORMER GENERATES HEAT AND MAY CAUSE BURNS IF HANDLED WITH BARE HANDS.

NEVER ATTEMPT TO RECALIBRATE A LOGIC CARD IN THE FIELD, OTHER THAN SETTING BATTERY CHARGER VOLTAGE JUMPERS (SECTION 6.9) OR APM AUTOMATIC PROGRAM JUMPERS (SECTION 6.10).

ALPHA TECHNOLOGIES IS NOT RESPONSIBLE FOR BATTERY DAMAGE DUE TO IMPROPER CHARGER VOLTAGE SETTINGS. REFER TO THE CHARGE VOLTAGE CHART (SECTION 6.9) AND CONSULT THE BATTERY MANUFACTURER FOR CORRECT CHARGE VOLTAGE REQUIREMENTS.

WHEN REMOVING BATTERIES, ALWAYS SWITCH THE MODULE'S BATTERY BREAKER OFF BEFORE UNPLUGGING THE BATTERY CONNECTOR.

WEAR SAFETY GLASSES WHENEVER WORKING WITH BATTERIES.

Procedure:



8.1 Check Battery Terminals and Connecting Wires



Check each battery terminal and connection. Make sure the posts are clean and the crimped connectors are tight. One major battery manufacturer suggests that terminal connectors be torqued to 75 inch/pounds at installation and then re-torqued to 60 inch/pounds during routine maintenance. If there is an "in-line" fuse in the battery cable, check the fuse holder and fuse. Make sure the terminals are properly greased with an approved battery terminal corrosion inhibitor such as NCP-2.



8.2 Check Battery Open Circuit Voltage



Switch the battery breaker on the side panel of the power module to OFF. Disconnect the battery connector from the module and measure the individual voltage across each battery. The difference between any battery in the string should not be greater than 0.3 VDC. Defective or marginal batteries should be replaced with an identical type of battery.



8.3 Check Battery Voltage Under Load

This is the most accurate method to determine the condition of the batteries.



CAUTION: Weak or severely discharged batteries can explode when put under load. As an added safety precaution, place the enclosure's door between the technician and batteries before attempting inverter operation.

If the batteries appear functional, reconnect the battery connector to the power module and switch the battery breaker ON. Switch the AC circuit breaker OFF to put the unit into STANDBY mode. Measure individual battery voltages under load. There may be a rapid drop in voltage when the inverter first comes on, but it should stabilize within several minutes. The difference between any of the batteries should not be greater than 0.3 VDC. Replace defective or marginal batteries with an identical type of battery.



8.4 Check Battery Charger (FLOAT) Voltage

Reconnect the AC input and wait for 1 minute to allow the unit to return to AC LINE operation. The green, "LINE POWER" and "AC OUTPUT" LEDs in the System Status block will be ON. Make sure the green, "FLOAT" LED in the Charger Status block is ON. If necessary, press the "CHARGE MODE" switch once. Switch the battery breaker on the side of the power module OFF and disconnect the battery connector. Switch the battery breaker ON and measure the DC voltage across the contacts of the module's battery connector. Since the battery charger is temperature compensating, the charge voltage will vary depending upon the temperature measured at the batteries or inside the enclosure. The normal float charge for three gelled electrolyte batteries is approximately 41 VDC at 77° F (25° C) for 36 VDC systems. On hot days, the charge voltage will be several volts lower; on cold days, it will be higher. Record the float voltage in the power supply maintenance log. The jumpers at JP1 on the Main Circuit Module assembly are designed for easy calibration of float charge voltages for different battery types. Always refer to the battery manufacturer for correct voltages (See section 6.9).



8.5 Check Battery Charger (EQUALIZE) Voltage

Press the "CHARGE MODE" switch once on the front panel to activate the yellow, "EQUALIZE" LED. Measure the voltage across the contacts of the module's battery connector. Depending upon the equalize switch setting, the equalize voltage will be in increments of 0.9 VDC (per jumper setting) higher than float. Record the equalize voltage in the power supply maintenance log. Switch the battery breaker OFF and reconnect the batteries to the unit. Switch the battery breaker ON and press the "CHARGE MODE" switch once to return the charger to float mode. The jumpers at JP1 on the Main Circuit Module assembly are designed for easy calibration of equalize charge voltages for different battery types. Always refer to the battery manufacturer for correct voltages (See section 6.9).



8.6 Check Output Voltage

Measure the AC output voltage across the contacts of the module's output connector using a true RMS digital voltmeter. The output voltage reading should fall between +/- 5% of the nameplate value (i.e. 57.0 VAC to 63.0 VAC for 60 VAC systems at nominal 120 VAC line input.) Record the voltages in the maintenance log.



8.7 Check Output Current

Check the module's output current. The front panel LED display is useful in determining the status of the output load. If none of the LEDs are lit, check the "AC OUTPUT" LED in the System Status block. If it is OFF, check the AC output fuse on the side panel. Also make sure that "ALT/ON" switch on the SPI is in the "ON" position. If the meter appears several Amps above the rated output of the module, a short circuit or overload condition exists in the load.



8.8 APM Manual Self-test

On units equipped with the APM (Automatic Performance Monitor) logic upgrade, self-test can be manually activated to trouble-shoot the batteries and inverter. Press the "TEST/RESET" switch once. The yellow "TEST IN PROGRESS" LED will come ON to indicate test mode. If a failure occurs, either the red "CHECK BATTERIES" or "CHECK INVERTER" LED will flash to indicate the circuit that has failed. To manually exit self-test and return the module to AC LINE operation, press the "TEST/RESET" switch once.

8.8.1 "TEST IN PROGRESS" (yellow) LED ON

The yellow "TEST IN PROGRESS" LED indicates that the unit is in self-test mode. The duration of the test is determined by the switch setting on the APM logic upgrade.

8.8.2 "CHECK BATTERIES" (red) LED FLASHING

If the red "CHECK BATTERIES" LED is flashing, it indicates that one or more of the batteries are unable to carry the load or that a connection in the battery circuit is malfunctioning. Make sure that the battery breaker on the side of the power module is not tripped. Check the battery terminals and crimped connectors on the battery cable kit. Measure individual battery voltages under load and replace the faulty battery if necessary. Reactivate the self-test mode to verify that the problem has been corrected.

8.8.3 "CHECK INVERTER" (red) LED FLASHING

If the red "CHECK INVERTER" LED is flashing, it indicates that the inverter has failed to produce AC at the output. Check the AC output fuse on the side of the power module and replace it if necessary. Reseat or replace the main circuit assembly. Reseat or replace the plug-in logic upgrade. Reactivate self-test to verify that the problem has been corrected. If the power module continues to fail self-test, it should be replaced.



8.9 Main Circuit Module and Logic Board Maintenance

SERVICE AND CALIBRATION SHOULD ONLY BE PERFORMED BY A QUALIFIED TECHNICIAN OR ALPHA SERVICE CENTER.

1. Carefully remove the Main Circuit Module assembly (See section 6.8).
2. Inspect the assembly for signs of dust or corrosion. Note: Circuit boards and logic upgrades are static-sensitive and should be handled with care. Clean with a damp rag or soft, non-metallic brush if necessary and allow to dry completely.
3. Clean the card edge connector with an alcohol-based cleaner (such as greaseless TV tuner cleaner). Also check the mating card edge connector inside the power module and clean if necessary.
4. Carefully tighten any screws used for mounting components to the heatsink. Make sure that plug-in attachments such as APM or USM logic upgrades are firmly seated. Do not over-tighten semiconductor mounting hardware.
5. If the module is equipped with a SDD (Standby Data Display), check the lithium battery, located on the front of the main board, and replace if necessary. Use Alpha #185-003-10, (3VDC).
6. Re-install the Main Circuit Module assembly and test the unit for proper operation (See section 7.1).



8.10 Fuse Replacements

BATTERY CHARGER FUSE

The XM Series power module contains 1 internal fuse (F301) located near the heatsinks on the Main Module assembly. This 10 Amp slow-blow fuse protects the DC charger circuit. If the batteries appear under-charged, first check the terminal connections and measure the voltage at the "BATTERY INPUT" connector. If no charge voltage is present, check the fuse. If it is open, there may be a problem with the battery charger.

TROUBLE-SHOOTING AND REPAIR

The trouble-shooting guide is designed to display typical symptoms, causes and solutions, starting with the most obvious and working systematically through the unit. Alpha Technologies recommends that the power supply's maintenance log accompany units brought in for bench service to aid the technician in trouble-shooting the problem.

9.1 Repair Instructions

On units returned to Alpha Technologies for repair, a Return Material Authorization (RMA) should first be obtained from Alpha's Customer Service Department. The RMA should be clearly marked on the unit's original shipping container. If the original container is no longer available, the unit should be packed with at least 3 inches of shock-absorbent material. Note: Do not use popcorn type packing material. Returns should be prepaid and insured (COD and freight collect can not be accepted without prior approval). It is recommended that any information pertaining to the nature of the power supply failure or problem, along with a copy of power supply's maintenance log, be included with the returned unit.

ALPHA TECHNOLOGIES DOES NOT ASSUME RESPONSIBILITY FOR SHIPPING DAMAGE CAUSED BY IMPROPER PACKAGING ON RETURNED UNITS.

9.2 Parts Ordering Instructions

When ordering parts from Alpha Technologies, contact the Customer Service Department directly at (206) 647-2360; or (604) 430-1476 (Canada and International).

9.3 Common Parts for XP Series Uninterruptible Power Supplies

Alpha Part Number	Description
SPARE PLUG-IN MODULE ASSEMBLIES	
740-143-20	Plug-In Module 120V 60 Hz, 36V Batt w/out SDD option (XM 6007, 6010, 6012, 6015)
740-143-21	Plug-In Module 230V 50 Hz, 36V Batt w/out SDD option (XM E 6007, 6010, 6012, 6015)
740-143-23	Plug-In Module 120V 60 Hz, 36V Batt with SDD option (XM 6007, 6010, 6012, 6015)
740-143-24	Plug-In Module 230V 50 Hz, 36V Batt with SDD option (XM E 6007, 6010, 6012, 6015)
740-143-26	Plug-In Module 120V 60 Hz, 24V Batt w/out SDD option (XM 6010-24)
740-143-27	Plug-In Module 120V 60 Hz, 24V Batt with SDD option (XM 6010-24)
740-143-28	Plug-In Module 220V 60 Hz, 36V Batt w/out SDD option (XM 6015 P)
740-143-29	Plug-In Module 220V 60 Hz, 36V Batt with SDD option (XM 6015 P)
740-143-30	Plug-In Module 230V 50 Hz, 48V Batt w/out SDD option (XM 6015-48 SE)
740-143-31	Plug-In Module 230V 50 Hz, 48V Batt with SDD option (XM 6015-48 SE)
740-143-50	Plug-In Module 230V 50 Hz, 36V Batt w/out SDD option (XM 4808 E)
740-143-51	Plug-In Module 230V 50 Hz, 36V Batt with SDD option (XM 4808 E)
740-143-52	Plug-In Module 230V 50 Hz, 24V Batt w/out SDD option (XM 4808-24 E)
740-143-53	Plug-In Module 230V 50 Hz, 24V Batt with SDD option (XM 4808-24 E)
740-143-60	Plug-In Module 100V 60 Hz, 36V Batt w/out SDD option (XM 6015-J6)
740-143-61	Plug-In Module 100V 60 Hz, 36V Batt with SDD option (XM 6015-J6)
740-143-62	Plug-In Module 100V 50 Hz, 36V Batt w/out SDD option (XM 6015-J5)
740-143-63	Plug-In Module 100V 50 Hz, 36V Batt with SDD option (XM 6015-J5)
740-143-64	Plug-In Module 100V 60 Hz, 24V Batt w/out SDD option (XM 6005-24 J6)
740-143-65	Plug-In Module 100V 60 Hz, 24V Batt with SDD option (XM 6005-24 J6)
740-143-66	Plug-In Module 100V 50 Hz, 24V Batt w/out SDD option (XM 6005-24 J5)
740-143-67	Plug-In Module 100V 50 Hz, 24V Batt with SDD option (XM 6005-24 J5)

9.3 Common Parts for XP Series Uninterruptible Power Supplies

Alpha Part Number	Description
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REPLACEMENT PARTS FOR PLUG-IN MODULE ASSEMBLIES

185-003-10	3V Lithium Battery
460-039-10	12A 250V Fuse
540-034-10	Jumper Plugs
700-106-20	APM Plug-In Logic Card
700-150-20	USM Status Monitor Card (Specify Application)

SPARE BACKPLANE BOARD PARTS

491-004-10	Standby Relay
491-032-10	SSR Relay
740-142-20	120V MOV Assembly
740-142-21	220/240V MOV Assembly

SPARE CHASSIS ASSEMBLY PARTS

210-007-11	12uF 660V Oil Capacitor
210-008-11	15uF 660V Oil Capacitor
460-030-10	10A 250V Slo Blo Fuse (XM 6005)
460-043-10	15A 250V Slo Blo Fuse (XM6012)
460-057-10	20A 250V Slo Blo Fuse (XM6015)
460-097-10	12A 250V Slo Blo Fuse (XM6010)
460-102-10	10A 250V Slo Blo Fuse (XM 4808 / XM 6007)
470-082-10	Circuit Breaker
520-004-10	Fuseholder

SPARE ENCLOSURE PARTS

020-019-31	Output Filter/SPI for PME; PWE; PWV
020-019-32	Output Filter/SPI for UPE
020-019-32	Output Filter/SPI for UPE/M
160-002-10	MOV for SPI
470-013-10	Circuit Breaker 15A Plug-In Type

ACCESSORIES

189-004-10	Battery Carrying Handles
020-098-21	LA-P Plug-in Lightning Arrestor 120V Version
390-004-10	#1822 Lamp Bulb (LRI Spare Bulb)
390-006-10	60PSB5 Lamp Bulb (ACI Spare Bulb)
460-055-10	60A 300V Fuse
654-006-10	LRI Red Lens (Spare Lens)
654-019-10	ACI Green Lens (Spare Lens)
740-139-20	LRI Lamp Assembly
740-162-20	RTS Remote Temperature Sensor
740-167-20	ACI Lamp Assembly
740-171-20	XPA Adaptor Kit (Adapts AP type enclosures to XP Module)
740-197-20	Retrofit Kit TWL Option (Changes line cord plug to twist lock type)
740-216-23	Tamper Switch Kit UPE/UPE-M
740-216-24	Tamper Switch Kit PME
740-216-25	Tamper Switch Kit PWE
870-180-20	BCK-X Battery Cable Kit
870-180-21	BCK-FX Fused Battery Cable Kit
870-231-20	ICK/U PSM-2 to USM-A Interface Cable

9. TROUBLE-SHOOTING AND REPAIR

9.4 TROUBLE-SHOOTING GUIDE

SYMPTOM

No output to cable;
No AC line power;
Green "AC OUTPUT" LED off;
Green "LINE POWER" LED off;

PROBABLE CAUSE

Utility power outage.

AC power cord unplugged.
Red "STANDBY POWER" LED off:
AC input circuit breaker
tripped.

Battery breaker tripped.

In-line fuse open (BCK-FX)

Battery cable disconnected.

Battery voltage below
Low Voltage Cutout threshold
from extended power outage.
(Batteries have been automatically
disconnected by main control board
to prevent over-discharging).

Marginal battery capacity.

REMEDY

Use voltmeter to verify
input voltage at receptacle.

Plug in AC power cord.

Reset AC circuit breaker.

Reset battery breaker.

Replace fuse.

Connect battery cable.

If alternative power source
is available, connect the power
module and allow it to recharge
the batteries.

Check batteries and
replace if necessary.

SYMPTOM

No output to cable;
AC line power available;
Green "AC OUTPUT" LED off;
Green "LINE POWER" LED on:

PROBABLE CAUSE

AC output fuse open.

SPI "ALT/ON" switch
in wrong position.

Loose seizure screw inside SPI.

SPI not connected to
module.

REMEDY

Replace fuse.

Move switch to
"ON" position.

Tighten screw.

Check module's
AC OUTPUT connector.

SYMPTOM

No output to cable;
No AC line power;
Green "AC OUTPUT" LED off;
Red "STANDBY" LED on:

PROBABLE CAUSE

AC output fuse open.

SPI "ALT/ON" switch
in wrong position.

Loose seizure screw inside SPI.

SPI not connected
to module.

REMEDY

Replace fuse.

Move switch to
ON position.

Tighten screw.

Check module's
AC OUTPUT connector.

SYMPTOM

Incorrect output voltage.

PROBABLE CAUSE

Wrong type of voltmeter used.

Under-loaded output
(less than 1 Amp).

Over-loaded output.

Faulty resonant capacitor
(will appear swollen or
distorted; may leak oil).

REMEDY

Use true RMS meter.

Connect load.

Reduce load.

Replace capacitor C1.

9.4 TROUBLE-SHOOTING GUIDE, *continued*

SYMPTOM

Low output voltage when unit is in STANDBY mode.

PROBABLE CAUSE

Defective inverter transistors.

REMEDY

Replace power board assembly.

SYMPTOM

No output voltage when attempting to transfer from LINE to STANDBY; "Clicking" sound from contactor.

PROBABLE CAUSE

Battery breaker off.

Battery voltage below recharge acceptance level.

High resistance at battery connector.

Main circuit module incorrectly seated in back plane connector.

Faulty logic.

Inverter transistors damaged.

Faulty standby relay.

REMEDY

Switch battery breaker on.

Check battery voltages; check terminal connections; charge or replace batteries if necessary.

Check battery open circuit voltages; clean and tighten each connection; replace faulty battery.

Remove, clean and reseal assembly.

Replace main circuit module.

Replace power board.

Replace relay K101.

SYMPTOM

module does not transfer from STANDBY to LINE mode when input power is restored; Contactor "clicks" periodically.

PROBABLE CAUSE

Low AC line voltage.

High impedance AC line.

Faulty logic.

REMEDY

Use voltmeter to verify nominal voltage at receptacle.

Check all connections. Check for correct wire gauges; Shorten cables to AC utility.

Replace main circuit assembly.

SYMPTOM

Batteries will not charge.

PROBABLE CAUSE

Battery breaker off

Faulty batteries.

Charger fuse F301 open. (on main circuit module)

Faulty charger circuit.

Charger transistors damaged.

REMEDY

Switch battery breaker on.

Check open circuit voltage; Check voltage under load; Check terminals and connecting wires. Replace faulty batteries.

Replace 10 Amp fuse.

Replace main circuit module.

Replace power board.

9. TROUBLE-SHOOTING AND REPAIR

9.4 TROUBLE-SHOOTING GUIDE, *continued*

SYMPTOM

Incorrect, or no float or equalize charge voltages:

PROBABLE CAUSE

Battery breaker off.

Jumpers at JP1 incorrectly set on main circuit module.

Charger fuse F301 open (on main circuit module).

Faulty logic.

Charger transistors damaged.

REMEDY

Switch battery breaker on.

Check jumpers.
(See section 6.9)

Replace 10 Amp fuse.

Replace main circuit module.

Replace power board.

SYMPTOM

Battery breaker trips when attempting to transfer from LINE to STANDBY mode:

PROBABLE CAUSE

Inverter transistors damaged.

Faulty logic.

REMEDY

Replace power board.

Replace main circuit module.

SYMPTOM

10 Amp charger fuse F301 (on main circuit module) open:

PROBABLE CAUSE

Faulty fuse.

Faulty charger circuit.

Defective charger transistors.

REMEDY

Replace fuse.

Replace power board and/or main circuit module.

Replace power board and/or main circuit module.

SYMPTOM

MOV in SPI darkened or destroyed:

PROBABLE CAUSE

Lightning or other transient damage on the output.

REMEDY

Replace MOV in SPI.

SYMPTOM

Red "CHECK BATTERIES" LED and LRI lamp (if installed) flashing:

tors.

PROBABLE CAUSE

Low or no battery voltage during APM self-test mode.

REMEDY

Check battery circuit breaker.
Check battery fuse if installed.
Check terminals and connec-

Check open circuit voltage.
Check voltage under load.

SYMPTOM

Red "CHECK INVERTER" LED and LRI lamp (if installed) flashing:
test.

PROBABLE CAUSE

Short on output during APM self-test mode.

Loss of AC output during APM self-test mode.
Output fuse open.

Loss of AC output during APM self-test mode.
Output fuse OK.

REMEDY

Check for short. Press "TEST/RESET" switch to re-

Replace output fuse.
Press "TEST/RESET" switch to re-test.

Replace power board and/or main circuit module.

WARRANTY.

Alpha Technologies, Inc., provides a LIMITED WARRANTY covering the performance of its Broadband products. The terms and conditions of the LIMITED WARRANTY STATEMENT are contained in a separate written LIMITED WARRANTY STATEMENT included with the Operator's manual provided with this product. If there are any warranty claims, the purchaser (or purchaser's representative) must follow the LIMITED WARRANTY guidelines, described in the applicable LIMITED WARRANTY STATEMENT.



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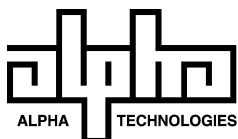
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